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EXPERIMENTAL EMPIRICISM IN CHEMOTHERAPEUTIC RESEARCH.

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IN recent years the rational approach to chemotherapeutic problems has been discussed extensively.[1][2][3][4][5] This paper is concerned exclusively with the empirical side of chemotherapy, because it is my opinion that both rational and empirical investigations are essential for progress in research and for correct clinical application.

The Past.

When Ehrlich made his first attempts to discover chemotherapeutic substances, he endeavoured to find compounds which would selectively penetrate the parasite without showing affinity for the cells of the host. In Ehrlich's picturesque and precise language, these properties were designated as parasitotropy and organotropy respectively. These specific affinities were thought to be caused by chemical attractions of different strength, and the well known example of a mixture of chromate-chloride-and-silver-ions was cited to symbolize the different affinities of one substance to two different reagents.

After the initial successes of chemotherapeutic research certain inconsistencies became obvious, and two views opposed to the original theory emerged. The first was in sharp conflict with Ehrlich's opinion. It was held by Uhlenhuth[6] that effective drugs have no direct action on the parasite, but achieve their result by increasing the natural defences of the host.

The second theory tried to combine the two opposing schools of thought. It was defended mainly by the French school under Levaditi,[7] who tried to prove that the chemotherapeutic substance is without effect in its original form, but must be converted into an active modification by the animal body. It is interesting to note that both theories were again widely discussed after the introduction of the sulphonamides.

No decisions concerning these fundamental problems were reached until the early 1930's, when the interest in chemotherapy, which had been discouraged by a succession of failures and false hopes, received a new stimulus by the rediscovery of emetine,[8][9] by the experimental researches on antimony[10] and on bismuth,[11] and mainly by the synthesis of "Germanin" and "Plasmoquine".[12] The purely empirical stage was past and the period of experimental research had begun.

Progress was made almost simultaneously by different workers. Yorke, Murgatroyd and Hawking[13] titrated solutions of trypanocidal drugs on trypanosome-infected animals before and after "absorption" with large numbers of trypanosomes. After the solutions had been in contact with living trypanosomes, their curative titre was significantly lowered.

Reiner, Leonard and Chao[14] found that trypanosomes which had been in contact with solutions of arsenicals contained measurable amounts of arsenic. Both series of experiments had been performed *in vitro*, and the results could not, therefore, be regarded as proof that chemotherapeutic substances penetrated the trypanosomes during treatment of an infected animal.

The first clear demonstration of this phenomenon was given by Jancsó,[15] who found that trypanosomes in the blood of animals treated with trypaflavine exhibited strong fluorescence when observed under the microscope in ultra-violet light. In a series of researches I myself, together with Fischl and Kotrba,[16][17] was able to show that arsenic, gold, antimony and various dyes are selectively bound by trypanosomes, spirochætes and plasmodia in the blood of infected animals or patients, and thus brought the final proof that chemotherapeutic substances selectively penetrate the living parasite in the body of the infected host. Shortly afterwards Jancsó applied Bechhold's ultracrystallization method to blood films of infected and treated animals and could actually visualize the penetration and distribution of the injected gold compound in the cell of the parasite.[18] Further, it appears that not only does the drug itself show this special affinity for the parasite, but even the active constituent in the case of the metal compounds. Thus, if chemical combinations of an arsenobenzol or similar compound with antimony, gold, silver, copper or mercury are used for

treatment of an infected animal, only arsenic, gold or antimony is found in the parasite and never a trace of the inactive copper, silver or mercury.[19] These results finally disposed of a theory which had been much discussed—namely, that a metal which shows strong disinfectant properties *in vitro* but is ineffective *in vivo* can be "led" into the parasite if the organic part of the molecule is constructed in the proper way.

Successful as these researches had been, final proof for the direct action of chemotherapeutic drugs was still lacking. It could be shown that not only do the active compounds penetrate the cell of the parasite, but also some inactive substances do so. This was demonstrated for trypaflavine in the case of malarial parasites, with "Atebrin" for trypanosomes, for the inactive "Rivanol" for both, and finally for all three dyes in the case of spirochætes. Similar observations were made with certain arsenic and gold compounds.[20]

It was only by the study of drug-resistant strains of trypanosomes and spirochætes that further advances were made. It was shown that the amount of drug taken up by drug-fast strains was inversely proportional to their drug resistance. The higher the resistance of the strain, the smaller the amount of drug which is absorbed under standard conditions both *in vivo* and *in vitro*. These results proved that the resistance of the strain was caused by a change in the membrane, preventing penetration of the drug into the cell. Similar observations were made with *Trypanosoma lewisi*, which is unaffected by most trypanocidal drugs.[21]

Still another problem remains unsolved: when spirochætes or trypanosomes are exposed *in vitro* to solutions of arsenicals, gold compounds or antimony preparations, although large amounts of drug are absorbed in a short time, the parasites are not killed and even retain their full infectivity if transferred to a susceptible animal. Further, if virulent spirochætes or trypanosomes are injected into an animal which is resistant to the particular strain and in whose blood the parasites circulate as inert foreign bodies, treatment with highly active drugs is ineffective.[22] Moreover, the susceptibility of trypanosomes changes with the adaptation to different animal species.[23][24]

Two facts can be cited to explain these difficulties. Organisms in unnatural surroundings, either *in vitro* or in a resistant animal, do not exhibit full metabolic activity; they are in a state of dormancy and therefore more resistant to all extraneous influences.[25] Smaller amounts of drugs will be more effective *in vivo* than *in vitro*, because even slight damage to the parasite makes it susceptible to the natural defence mechanisms. It was proven by Kritschewsky[26][27] that the therapeutic efficacy of all drugs decreases greatly when the reticulo-endothelial system of the animal is damaged.

In the case of the arsenicals, a plausible explanation for the importance of the metabolism of the parasite for the effectiveness of the drugs can be found in the conversion of the pentavalent arsenicals or the arsenobenzols into the arsenoxide stage; this theory, however, is hardly applicable to substances of such different natures as gold, mercury, antimony, bismuth and certain organic compounds such as the acridins or substances of the type of "Germanin". The observation that para-amino-benzoic acid gives protection against toxic doses of pentavalent arsenicals without interfering with their therapeutic action[28] makes the problem still more obscure.

The following deductions, which now seem to be well confirmed, can be made from these studies:

1. Trypanocidal and spirocidal metal compounds—with the exception of the mercury compounds—are selectively absorbed by the parasite.

2. Some of them—that is, the arsenicals—are converted into a more active form by the metabolism of the parasite.

3. The damaged parasite, before it can be killed by the drug, is destroyed by the natural defence mechanism of the host.

At this stage, apart from a number of observations of a different nature which will be discussed later, there existed an uneasy feeling that these generalizations did not explain all the facts. A vexed question was that the most potent trypanocidal drug, "Germanin", was the least active *in vitro*, and that the acridine derivatives, whose curative indices were of the order of 1 : 2, were the strongest under the same conditions.

It was only after the advent of the sulphonamides that a fact of fundamental importance which had been overlooked was put in the right perspective and served as a possible explanation for some of these inconsistencies. The extensive experimental study of the mechanism of action of these new drugs clearly demonstrated for the first time that a potent drug can act "from outside" without being selectively absorbed by the parasite and without apparently interfering with its internal metabolism. Reinvestigation of the whole question would probably yield the result that some drugs interfere with the internal metabolism of the cell and others with the external, nutritional metabolism. Further, it may well be that part of the activity of the arsenicals and other metal compounds is caused by a similar mechanism which has been overlooked because attention centred on the highly significant observations on selective absorption and interference with internal metabolism.

In the previous section we were dealing with fairly well established experimental facts, but now we enter the realm of conflicting experimental evidence and opposing theories.

The Present.

One of the oldest and most obscure problems in chemotherapy is the question of the selective affinity of the drug for the parasites, and as has already been mentioned, Ehrlich's original concept was the existence of strong chemical attraction. In the light of modern knowledge this opinion can no longer be held, but it is rather difficult to formulate another that is just as satisfactory and simple.

It is very likely that physical phenomena connected with the surface charge of particles of more than molecular size and/or loose combinations of the chemotherapeutic drugs with large molecules of body constituents are responsible for this phenomenon. How these forces operate and whether it is feasible to explain the behaviour of different drugs in the same way is still obscure, and research in this field is particularly difficult. For the arsenicals and the acridines a theory was proposed simultaneously and based on different experimental evidence by myself.[29] and by Broom, Brown and Hoare.[30] The motive force was considered to be the negative charge of the combination product—that is, drug *plus* large molecule—attracted by the positive charge on the surface of the trypanosome. It is highly significant that according to Broom and his collaborators the charge on the surface of the trypanosomes can change from positive to negative under certain conditions and that such variants are considerably more resistant against arsenicals. Recently King and Strangeways[31] investigated the effect of a number of substituted phenyl-arsenoxides on trypanosomes *in vitro*, and deduced from their effect that substances of this type can act in three different ways according to their solubility and their lipophilic or polar properties. Their results, however, cannot be used to explain the selective affinity of drugs for the parasite. Drug-resistant strains show the same electrical behaviour as the normal strains, so that the hopes that the phenomenon described by Broom would yield a simple explanation of the drug-fastness were unfulfilled.

A much graver difficulty faces the student in the phenomenon of chemotherapeutic interference. Two complete sets of well-confirmed experimental results were obtained, each of which would explain the phenomenon satisfactorily; but unfortunately at present they stand quite apart and even seem to exclude each other.

One group of scientists[32][33] found that the interfering substances rendered the membrane of the parasite impermeable to the trypanocidal substance; this was similar to the behaviour observed in drug-resistant strains.

Following an observation[34] on the interference phenomenon caused by ascorbic acid, Jancsó[35] proved that only substances which formed reversible redox systems, the potentials of which belong to a certain range, produced the interference phenomenon. He explained the phenomenon on the assumption that the interfering substances acted as accessory respiratory catalysts and either replaced the catalysts damaged by the active drug or prevented this damage. The probability of this was strengthened by the studies of Scheff and Hassko[36] on oxygen and sugar consumption of trypanosomes in interference experiments. It is hard to imagine how ascorbic acid, which maintains the respiration and sugar consumption of a cell at the normal level, can make it impermeable to arsenic.

Up to now I have been at some pains not to refer to malaria, the most important of the protozoal diseases. As soon as we consider the chemotherapy of this infection, confusion reigns supreme. "Thiobismol", for instance, acts exclusively on parasites of benignant tertian malaria sixteen to twenty-eight hours old and can therefore be used to regulate induced infections. It has no action on parasites which are younger or older, and no effect on quartan or falciparum infection.[37] Even if we grant that the chemical constitution and the metabolism of the sexual

and the asexual stages of the same organism can vary to a certain extent, it is difficult to consider that these differences are such as to render the asexual stages resistant to therapeutic doses of "Plasmoquine" and the sexual ones resistant to "Atebrin". What is the mechanism of action of "Plasmoquine" that it does not interfere at low concentrations with the life and the flagellation of the gamete in the stomach of the mosquito, but causes the development of the cyst to stop at a certain stage ?[38] This is more in line with the function of the rather mysterious "lethal factors" of the geneticists than with the action of a simple chemical substance. It would lead us into too many involved matters if we were to discuss evidence that not only certain chemotherapeutic drugs but even some types of immune bodies interfere with the life processes of the parasite only at a certain stage of cell division or sexual development.

However, to return to a simpler question, how can it be explained that both "Atebrin" and "Plasmoquine", not to mention quinine, are devoid of any action on the endothelial or blood forms of the primary "unpigmented" stages of the malarial parasites, and that quinine treatment even gives a simple means for establishing a pure strain of these stages ?[39] Again, why should a drug of the highest promises—"Certuna"—have to be withdrawn because, even if it was highly active against the gametocytes of malignant tertian malaria, it had no effect on any of the other stages or forms of the malarial parasites ?

In studies which had to be left incomplete, I was able to show that "Atebrin" was selectively absorbed both by the sexual and by the asexual stages of the three main types of malarial parasites. The resistance of the gametocytes cannot, therefore, be caused by a mechanism similar to the resistance of drug-fast strains. On the other hand, it seems possible that the resistance of the unpigmented stages may be caused by this mechanism. It could be shown that sporozoites in the infected mosquito had different staining characteristics from the blood forms of the malarial parasite, and in a few cases of the dreaded "pernicious" form of malignant tertian malaria, it was found that the parasites in these cases took up "Atebrin" much less readily than did the same parasites in an ordinary case. It is only a supposition; but it may well be that the curiously irregular and capricious action of the sulphonamides on malaria is due to the fact that their action is restricted to cases in which the "unpigmented" forms predominate. In passing, it may be mentioned that a diet rich in carbohydrate makes malaria prophylaxis with quinine difficult, and a diet rich in protein favours its prophylactic effect. This leads us back to the problem of natural resistance, with which we may conclude the discussion.

Recently[40] I presented the results of experimental investigations on the influence of iron, copper and zinc on diphtheria intoxication and infection. In the meantime a few more toxins have been tested, and it has been found that the phenomenon which had been investigated in detail with diphtheria toxin holds good for all of them. This serves to show that Uhlenhuth's hypothesis that the indirect action of chemotherapeutic substances was to increase the resistance of the host, which had been discarded as wrong some thirty years ago, is right after all. Substances do exist which exert a therapeutic action because they imitate the normal detoxication mechanism of the living body. Again, curious and at present unexplained variations occur, as is shown in Table I.

Mr. Cornish, of the Council for Scientific and Industrial Research, Melbourne, subjected these experimental results to statistical analysis and considered them highly significant; this means that the activity of the different metals varies with the toxin. Further, it could be shown that the therapeutic effect of these metals was not restricted to bacterial intoxication, but that certain allergic symptoms could be influenced in the same way. Skin reactions against proteins in allergic states and anaphylaxis form one of these groups.

The chemical changes which follow the action of the metal ions *plus* redox substances are still unknown. Can one be that the mechanism of action of the different metals is different, or are chemical differences in the substrate responsible for these variations ? No facts known to me give a lead in the investigation of this question; only crude experimental empiricism will furnish the answer.

The present state of knowledge may be summed up as follows:

1. Chemotherapeutic substances exist which act on the parasite because they are selectively absorbed and interfere with its internal metabolism. In such a case the blood concentration of the drug will be of secondary importance, because the affinity of the drug to the parasite is high. Most trypanocidal and spirocidal drugs and certain substances used in other protozoal infections fall into this group.

2. Other chemotherapeutically active substances are not absorbed, but exert their effect by interfering with the external nutritional metabolism of the cell. In treatment with these substances, such as the sulphonamides and probably "Germanin", penicillin, mercury compounds and others, the maintenance of an effective blood concentration will be all-important.

3. Other chemotherapeutic substances again do not interfere with the parasite at all, but exert their effect on toxic products of its metabolism, and in this way become active not against the infection, but against the infectious disease.

Is there another possible way in which a drug may influence the outcome of an infectious disease ? If so, it is safe to assume that even such substances will be discovered in time.

The Future.

Every scientific investigation proceeds through three stages, which can be characterized by three monosyllabic words: what, how and why. In the history of chemotherapy these phases are perhaps more clearly marked than in many other fields of research, because the object in pharmacology and especially in chemotherapy is to find one single substance which exerts the desired effect, even if this substance is not of immediate practical importance, to study its mechanism of action with the object of improving on the original substance, and finally, if a highly active drug has been obtained, to translate the living facts into the dead symbols of mathematics, physics or chemistry, which are nowadays accepted as "scientific truth".

The first two steps are usually termed the empirical approach—sometimes the "hit or miss" approach—and are often smiled at by the pure scientist. If we look back, however, we find that quinine, the drug of the greatest economic and strategical importance, was used for centuries, even before the restriction of its use to the malarial fevers defined it as a chemotherapeutic substance. Why quinine acts on the malarial parasite is still unknown, and no quinine-like substances of equal or better activity have been found.

It was a long way from the hardly perceptible anti-malarial action of methylene blue to the two potent drugs "Plasmoquine" and "Atebrin". The knowledge—or better, the ignorance—concerning their mechanism of action has been discussed in this paper.

Trypan blue, ineffective in natural trypanosome infections, was the starting-point for the invention of "Germanin". Of the hundreds of its analogues, not ten have any trypanocidal activity and none are of practical importance.

The importance of the empirical approach is even more clearly shown in the history of the two most recent additions to the chemotherapeutic armamentarium, the diamidines and the

TABLE I.

Curative Experiments on Mice Injected with Fatal Doses of Different Toxins.

Toxin.	Substance Used for Treatment.[1]							Controls.
	Fe^{++}	Fe^{+++}	Cu^{++}	Zn^{++}	Co^{++}	Ni^{++}	Mn^{++}	
Diphtheria	6/1	—	3/5	2/6	0/8	2/6	2/6	0/8
Staphylococcal	7/9	4/8	4/8	4/4	2/6	2/6	7/1	1/10
Welchii A	10/2	4/4	5/3	6/2	6/2	6/2	5/3	2/14
Welchii D	1/7	—	1/6	4/4	0/7	2/6	4/4	1/11

[1] The figures indicate how many mice survived and died in each group; for example, of those given diphtheria toxin and treated with Fe^{++}, 6 survived and 1 died; of those treated with Cu^{++}, 3 survived and 5 died *et cetera*.

sulphonamides. The clue to the discovery of the trypanocidal action of "Synthalin" was the fact that glucose is the most essential nutrient of trypanosomes. The lowering action of guanidine on the blood sugar level of the infected animal should have been the explanation of the observed effect in trypanosome infections. This was apparently a sound piece of logical reasoning, and one of the best examples of the importance of the scientific approach in the discovery of new drugs. It must, therefore, have come as a shock to the protagonists of the scientific approach in chemotherapy when Yorke proved that the diamidines are, in fact, a new group of trypanocidal and bactericidal substances, and that the effect on the blood sugar is incidental. Further, according to recent reports it seems as if the diamidines will be found more useful in the treatment of leishmaniasis and wound infection than of trypanosomiasis.

The success of Domagk is even more outstanding. Starting from the observation that most diazo-dyes showed some curative effect on streptococcal infection, he found the highly active "Prontosil". It is questionable whether his discovery can be designated as due to chance, because he followed the orthodox path from the substance showing a trace of activity to the substance of the highest practical importance. The discovery of Trefouel that the diazo linkage is in no way essential was another "hit or miss" discovery, and so was Fildes's observation that the effect is blocked by para-amino-benzoic acid.

Without any speculation, but just by a consideration of a moderate number of experimental facts, a fairly accurate guess can be made as to which metal compounds will have the highest efficacy in "antitoxic chemotherapy". This does not mean that anybody is able to predict whether these compounds will be of practical importance.

These remarks should not be taken as an implication that the scientific approach is valueless; very useful information can be gained from the study of physical and chemical characteristics of active drugs *in vitro*, and especially *in vivo*. However, I doubt very much whether it will be possible to produce active drugs by a consideration of these properties only. This opinion is founded on the fact that the same parasite can be attacked by drugs with different mechanism of action—for instance, trypanosomes by arsenicals, gold compounds and substances of the type of "Germanin", the diamidines and the tri-phenyl-methane dyes, and bacteria by sulphonamides and metabolites products of moulds, as for instance penicillin. If we restrict our researches to the known classes of active drugs and metabolites, we have to resign ourselves to the dull task of perfecting small improvements. We should have to abandon the hope of ever obtaining new insight into unknown biological processes and be satisfied with achievements of practical merit. This is a perspective which might satisfy the manufacturer, but hardly the scientist.

However, there is a much more serious deterrent. The object of chemotherapy is to attack the infectious agent in his natural habitat, the living animal body. It seems to me that the precise formulæ of chemistry, the equations of physics and the symbols of higher mathematics are truth only in their "natural habitat"—that is, on paper. Applied to biological problems, they are nothing more than approximations and often not very close ones. Further, even if we assume that they persist in the maze of quickly changing reactions and alterations of a living body, we do not know the symbols which would describe with the same accuracy just these alterations and the conditions which change. Only recently crude empiricism has shown the way to the treatment of typhus fever.[42]

So it will, in all probability, happen again that some Columbus of chemotherapy will set out to discover an alternative way to the East Indies and find a new continent instead.

References.

(1) A. Albert: "Scientific Method in the Evolution of New Drugs. Part I, The Sulphonamides", *The Australian Journal of Science*, Volume IV, 1942, page 147; "Scientific Method in the Evolution of New Drugs. Part II, Sulphur-free Analogues of Sulfanilamide", *ibidem*, Volume V, 1943, page 143; "Scientific Method in the Evolution of New Drugs. Part III, The Arsenicals", *ibidem*, Volume V, 1943, page 175.

(2) J. E. Falk: "Scientific Method in the Evolution of New Drugs. Part IV, The Mercurials", *The Australian Journal of Science*, Volume VI, 1943, page 14.

(3) P. Fildes: "A Rational Approach to Research in Chemotherapy", *The Lancet*, Volume I, 1940, page 955.

(4) H. McIlwain: "Biochemistry and Chemotherapy", *Nature*, Volume CLI, 1943, page 270.

(5) H. McIlwain and F. Hawking: "Chemotherapy by Blocking Bacterial Nutrients", *The Lancet*, Volume I, 1943, page 449.

(6) H. Uhlenhuth: "*Demonstration von mit Atoxyl behandelten Dourine Kaninchen*", *Deutsche medizinische Wochenschrift*, Volume XXXIII, 1907, page 1237.

(7) C. Levaditi: "*Mécanisme d'action de l'atoxyl dans la syphilis expérimentale du lapin*", *Comptes rendus des séances de la Société de biologie*, Volume LXIV, 1908, page 911.

(8) L. Rogers: "The Rapid Cure of Amœbic Dysentery and Hepatitis by Hypodermic Injections of Soluble Salts of Emetine", *British Medical Journal*, Volume I, 1912, page 1424.

(9) L. Rogers: "Further Experience of the Specific Curative Action in Amœbic Disease of Hypodermic Injections of Soluble Salts of Emetine", *British Medical Journal*, Volume II, 1912, page 405.

(10) H. G. Plimmer and J. D. Thompson: "Further Results of the Experimental Treatment of Trypanosomiasis in Rats", *Proceedings of the Royal Society*, B, Volume LXXIX, 1907, page 505; *ibidem*, Volume LXXX, 1908, page 1.

(11) C. Levaditi: "*Le bismuth dans la syphilis*", *La Presse médicale*, Volume XXX, 1922, page 633.

(12) W. Schulemann: "Synthetic Anti-Malarial Preparations", *Proceedings of the Royal Society of Medicine*, Volume XXV, 1932, page 897.

(13) W. Yorke, F. Murgatroyd and F. Hawking: "Preliminary Contribution on the Nature of Drug Resistance", *Annals of Tropical Medicine and Parasitology*, Volume XXV, 1931, page 351.

(14) L. Reiner, C. S. Leonard and S. S. Chao: "Studies on the Mechanism of Chemotherapeutic Action", *Archives internationales de pharmacodynamie et de thérapie*, Volume XLIII, 1932, pages 186 and 199.

(15) N. von Jancsó: "*Wirkungsmechanismus der Chemotherapeutica bei Trypanosen*", *Klinische Wochenschrift*, Volume XI, 1932, page 1305.

(16) E. Singer and V. Fischl: "*Der Nachweis von Arsenikalien in Spirochäten und Trypanosomen*", *Zeitschrift für Hygiene und Infektionskrankheiten*, Volume CXVI, 1934, page 36.

(17) V. Fischl, J. Kotrba and E. Singer: "*Der Nachweis von Gold in Spirochäten und Trypanosomen*", *Zeitschrift für Hygiene und Infektionskrankheiten*, Volume CXVI, 1934, page 69.

(18) N. von Jancsó, H. von Jancsó and E. Novak: "*Mikrobiologische Grundlagen der chemotherapeutischen Wirkung; mikroskopischer Nachweis des chemotherapeutisch verabreichten Goldes in Spirochäten, Trypanosomen und Bakterien durch Ultrakristallisation*", *Zentralblatt für Bakteriologie, Parasitenkunde und Infektionskrankheiten*, Volume CXXXIV, 1935, page 76; "*Mikrobiologische Grundlagen der chemotherapeutischen Wirkung; die Bindung chemotherapeutisch verabreichter Goldverbindungen durch verschiedene Arten von Rekurrenzspirochäten*", *ibidem*, Volume CXXXIV, 1935, page 159.

(19) E. Singer, J. Kotrba and V. Fischl: "*Zur Frage der Kombinationstherapie*", *Zeitschrift für Hygiene und Infektionskrankheiten*, Volume CXVI, 1935, page 241.

(20) V. Fischl and E. Singer: "*Die Wirkungsweise chemotherapeutisch verwendeter Farbstoffe*", *Zeitschrift für Hygiene und Infektionskrankheiten*, Volume CXVI, 1935, page 348.

(21) V. Fischl and E. Singer: "*Die Chemotherapie der Rattentrypanosen*", *Zeitschrift für Hygiene und Infektionskrankheiten*, Volume CXVI, 1935, page 652.

(22) R. Wagner: "*Über die Wirkung von Solganal und Neosalvarsan bei unnatürlicher Infektion*", *Archiv für Dermatologie und Syphilis*, Volume CLXVII, 1933, page 595.

(23) C. H. Browning and R. Gulbranson: "Variation in Chemotherapeutic Susceptibility Associated with Change in Virulence of a Strain of Trypanosoma brucei", *The Journal of Hygiene*, Volume XXXV, 1935, page 180.

(24) F. Murgatroyd, W. Yorke and I. F. Corson: "The Changes Observed in T. Brucei During 5 Years' Maintenance in the Laboratory", *Annals of Tropical Medicine and Parasitology*, Volume XXXI, 1937, page 145.

(25) M. Rothermundt and H. Dale: "*Experimentelle Studien über die Wirkungsweise des Atoxyls in vitro und in Tierkörper*", *Zeitschrift für Immunitätsforschung und experimentelle Therapie*, Volume XII, 1912, page 565.

(26) J. L. Kritschewsky: "*Ueber noch unbekannte Funktion des retikuloendothelialen Systems; der Mechanismus der die Aktivität des chemotherapeutischen Effektes bestimmenden Funktion des retikuloendothelialen Systems und ihre Unabhängigkeit von der Schutzfunktion*", *Zeitschrift für Immunitätsforschung und experimentelle Therapie*, Volume LIX, 1928, page 1.

(27) J. L. Kritschewsky: "*Das retikulo-endotheliale System und Chemotherapie*", *Centralblatt für Bakteriologie, Parasitenkunde und Infektionskrankheiten*, Volume CIV, 1927, page 214.

(28) J. H. Sandground: "Studies on the Detoxication of Organic Arsenical Compounds", *Journal of Pharmacology and Experimental Therapeutics*, Volume LXXVIII, 1943, page 209.

(29) E. Singer: "*Die Wirkungsweise der Chemotherapeutika*", *Medizinische Klinik*, Volume XXXII, 1936, page 152.

(30) J. C. Brown, H. C. Brown and C. A. Hoare: "The Electric Charge of Hæmoflagellates", *Transactions of the Royal Society of Tropical Medicine and Hygiene*, Volume XXX, 1936, page 87.

(31) H. King and W. Strangeways: "Some Observations on Relation between Chemical Structure and Drug Resistance among Arsenicals", *Annals of Tropical Medicine and Parasitology*, Volume XXXVI, 1942, page 47.

(32) A. Hassko: "*Untersuchungen über den Wirkungs—Antagonismus chemotherapeutischer Mittel*", *Zeitschrift für Hygiene und Infektionskrankheiten*, Volume CXVI, 1935, page 669.

(33) H. N. Wright and A. D. Hirschfelder: "The Duplication in Vitro of the Interference Phenomenon in Combination Chemotherapy", *Journal of Pharmacology and Experimental Therapeutics*, Volume XXXIX, 1930, page 39.

(34) V. Fischl and L. Fischl: "*Arzneifestigkeit, Avidität, Interferenz*", *Zeitschrift für Immunitätsforschung und experimentelle Therapie*, Volume LXXXIII, 1934, page 324.

(35) N. von Jancsó and H. von Jancsó: "*Beziehungen zwischen Chemotherapeutischen Wirkung, Oxydationkatalyse und Redox potential*", *Zeitschrift fur Immunitätsforschung und experimentelle Therapie*, Volume LXXXVIII, 1936, page 275.

(36) G. Scheff and A. Hassko: "*Einfluss einiger chemotherapeutica auf den Stoffwechsel der Trypanosomen mit Rücksicht auf das Interferenz phenomenon*", *Zentralblatt für Bakteriologie, Parasitenkunde und Infektionskrankheiten*, Volume CXXXVI, 1936, page 420.

(37) M. D. Young, S. B. McLendon and R. G. Smarr: "Selective Action of Thiobismol on Induced Malaria", *The Journal of the American Medical Association*, Volume CXXII, 1943, page 492.

(38) M. A. Barber, W. H. Komp and B. M. Newman: "The Effect of Small Doses of Plasmochin on the Viability of Gametocytes as Measured by Mosquito Infection Experiments", *Public Health Reports*, Volume XLIV, 1929, page 1409.

(39) S. Adler and J. Tschernomoretz: "Continued Passage of Extra-erythrocytic Forms of Plasmodium Gallinaceum in Absence of Erythrocytic Schizogony", *Annals of Tropical Medicine and Parasitology*, Volume XXXV, 1941, page 241.

(40) M. H. Petherick and E. Singer: "The Biological Detoxication of Bacterial Toxins", *The Australian Journal of Science*, Volume V, 1943, page 137.

(41) P. van Meerendonk: "The Quinacrine-calcium Therapy of Typhus", *The Journal of the American Medical Association*, Volume CXXII, 1943, page 876.

THE Rh FACTOR IN THE BLOOD OF AUSTRALIAN ABORIGINES.

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SINCE the identification of the blood factor "Rh" by Landsteiner and Wiener (1940), only a few surveys have been made to ascertain the presence of this factor in different races. Blood samples from white persons have been examined in America, England, Australia and Germany. It would appear from these surveys that the blood of about 15% of the white persons examined is "Rh-negative".

Landsteiner and Wiener (1941) tested blood samples from 113 Negroes, and of these only nine were found which gave clearly negative findings; this lower incidence suggested a racial difference in the distribution of the Rh factor. Landsteiner, Wiener and Matson (1942) tested blood samples from 120 full-blooded Indians, and only one was found which was "Rh-negative"; in this single instance it could not be concluded with certainty that this fact was not due to some untraceable white admixture. Blood samples were also tested from 155 American Indians of mixed ancestry, and of these 148 (95·5%) were "Rh-positive" and seven (4·5%) were "Rh-negative". Levine and Wong (1943) found only one "Rh-negative" subject in a group of 150 Chinese living in New York City. Wiener (1942) suggested that the extension of Rh factor studies to other races should yield results of significance from the standpoint of racial origins.

The presence or absence of the Rh factor in the blood of Australian aborigines has not been previously determined. The most recent surveys carried out on the blood of this race have been concerned with blood groups, sub-groups and M, N types (Birdsell and Boyd, 1940; Wilson, Graydon, Simmons and Bryce, to be published).

As we have recently been engaged in a search for human anti-Rh serum of high titre and have tested the blood of over 3,600 white persons for the Rh factor in order to establish a pool of "Rh-negative" donors (Simmons, Graydon, Jakobowicz and Bryce, 1943), it was decided to test the blood of a small number of pure-blooded Australian aborigines collected from parts of Australia where blood samples could be most readily obtained, and to place on record the results of this survey.

Material and Methods.

The blood samples were obtained from selected aborigines through the courtesy of field collaborators. Two drops of blood were collected into rubber-stoppered phials containing one cubic centimetre of the sterile glucose-citrate solution of Rous and Turner,[1] and the samples were returned to us by aeroplane in "Thermos" flasks packed with ice. Human anti-Rh serum, "Mrs. C.", of high titre, was used for the tests, which were carried out by the slide technique. The blood samples were collected in New South Wales, Queensland, South Australia and the Northern Territory. The localities, together with the names of the field collaborators and the results obtained, are shown in Table I. As controls, samples of blood from about 10 white persons were obtained for us at the time when the aboriginal blood was collected. The blood groups of 40 of the 58 control camples had previously been determined. The groups, the sub-groups and the Rh factor were determined for all samples of blood immediately they were received in Melbourne, usually about four days after collection.

[1] After four months' storage at 5° C., cells of particular Rh sub-types preserved in Rous and Turner's solution containing 0·001% "Merthiolate" solution showed no evidence of lysis and gave the same results as when first collected.

Results.

Blood samples from 281 pure-blooded Australian aborigines and four hybrids were all found to be "Rh-positive" when tested with the human anti-Rh serum "Mrs. C."

All the blood samples from Hermannsburg Mission, and 24 of the other samples chosen at random, were tested against a second potent anti-Rh human serum, "Mrs. P.", which differed from serum "Mrs. C." in its reactions with Rh sub-types. Twenty-four samples chosen at random were also tested in tubes against some anti-Rh guinea-pig serum kindly supplied by the late Dr. K. Landsteiner. All of these samples were agglutinated by each of the sera used. Thus we were unable to detect Rh sub-types in the samples of aboriginal blood with the sera and the small blood samples at our disposal.

In the 58 control samples from white persons, both "Rh-positive" and "Rh-negative" reactors were found, and the previously determined blood groups were confirmed. This indicated that the cell suspensions were satisfactory at the time of testing.

The groups, sub-groups and M, N types of the majority of the aborigines in our series from Menindee, Oodnadatta and Woorabinda, had been determined in 1940 (Wilson *et alii*); but 29 of group A, not previously tested, were found to belong to sub-group A_1. In addition, 39 aborigines of group A living on Palm and Fantome Islands, and the 37 aborigines of group A from the Hermannsburg Mission, none of whom had been tested previously, were all found to belong to sub-group A_1.

Hermannsburg Mission.

The only previous blood group examination at Hermannsburg Mission was reported by Cleland (1930). He examined blood samples from 70 pure-blooded aborigines, and of these 34·3% were of group O and 65·7% were of group A. In an extensive survey of blood group frequencies of Australian aborigines conducted in 1941, the results of which will be published shortly by Wilson *et alii*, no blood samples were obtained from aborigines living at Hermannsburg Mission, but blood samples were obtained from aborigines at Alice Springs. These places are only about 80 miles apart. As it has not been convenient to add these results to those of the earlier survey, the results of the Hermannsburg blood-group frequencies are given in Tables II (*a*) and II (*b*) of this paper.

Discussion.

The finding of the Rh factor in all pure-blooded Australian aborigines completes yet another link in the blood similarities of American Indians and Australian aborigines. The original stock of each race probably possessed only two blood groups, A and O, and all persons of group A belong to sub-group A_1 (Landsteiner *et alii*, 1942; Wilson *et alii*). The main difference in the blood of these two races is that the Australian aborigines have the highest, and the American Indians almost the lowest, type N percentages yet found.

TABLE I.
Distribution of the Rh Agglutinogen in the Blood of Australian Aborigines.

Place.	State.	Collected by.	Number of Specimens.	"Rh-positive."	Blood Groups.		
					O.	A_1.	B.
Menindee.	New South Wales.	Dr. W. E. George.	22	22	1	21	0
Palm Island, Fantome Island.	Queensland.	Dr. F. R. Tod Stevens.	98	98	54	39	5
Oodnadatta.	South Australia.	Mr. John Connell.	34	34	17	17	0
Woorabinda.	Queensland.	Dr. J. H. Blackburn.	57	57	23	34	0
Hermannsburg Mission.	Northern Territory.	Captain L. C. Lum.	70	70	33	37	0
Total	.. ..	.. ..	281	281	128	148	5

TABLE II (a).

Blood Group Frequencies of Pure-blooded Australian Aborigines at Hermannsburg Mission, Northern Territory.[1]

Locality.	Number Tested.	Number and Percentage of Groups.		Frequency of Genes.	
		A.	O.	p.	r.
Hermannsburg Mission	70	37 (52·9%)	33 (47·1%)	0·313	0·687

[1] In the absence of the B factor, the gene frequencies were derived simply from the equations: $p = 1 - \sqrt{O}$, $r = \sqrt{O}$.

TABLE II (b).[1]

Locality.	Number Tested.	Number and Percentage of Types.			Frequency of Genes.		D.	σ_D.	D/σ_D.	χ^2.	P.
		M.	MN.	N.	m.	n.					
Hermannsburg Mission ..	70	7 (10%)	28 (40%)	35 (50%)	0·300	0·700	−0·023	0·060	0·39	0·16	0·69

[1] The gene frequencies are calculated from the relations $m = \frac{2M + MN}{2V}$, $n = \frac{2N + MN}{2V}$, $D = 1 - \left(\sqrt{\frac{M}{V}} + \sqrt{\frac{N}{V}}\right)$, $\sigma_D = \frac{1}{2\sqrt{V}}$ where V = number tested. $\chi^2 = \frac{(b^2 - 4ac)^2 V}{(2a + b)^2 (b + 2c)^2}$ where a, b and c = number of individuals of types M, MN, and N respectively in a sample containing V individuals.

The figures relating to Palm and Fantome Islands are particularly interesting. Of the 98 samples tested, five were found to belong to group B, which gives a value (0·034) for the frequency of the gene q differing little from the values obtained by others for this area (Lee, 1926: $q = 0·040$; Birsdell and Boyd, 1940: $q = 0·025$).

If we assume—and there are grounds for this assumption—that this B factor was derived from comparatively recent Melanesian admixture, probably from the New Guinea area, where q is approximately 0·1, then the racial complex represented in Palm Island must be about one-quarter to one-third Melanesian.

If the frequency of the sub-group A_2 in the Melanesian is comparable with that found in most of the races so far examined, one would expect to find some aborigines at the Palm Island settlement belonging to sub-group A_2. As none was found, a forecast of a low frequency of the sub-group A_2 in the blood of New Guinea natives seems justifiable.[1]

Places of Origin of Aborigines.

The blood samples from the Menindee aborigines came from 10 family groups only, and their place of origin was in the region of the Darling River, New South Wales. The blood samples from Oodnadatta were all except three from adult aborigines, and the aborigines had congregated in Oodnadatta from 13 different districts, mostly in South Australia. Of the blood samples from Woorabinda, 43 were from adults who had originated in 40 widely scattered districts in Queensland.

It is possible that the blood of most of the Palm Island aborigines had previously been grouped and tested for the M, N factors by Birdsell and Boyd; but those of group A had not been sub-grouped. The 98 blood samples collected on Palm and Fantome Islands for the present Rh factor survey came mostly from adult aborigines who had originated in approximately 50 widely scattered places in the north of Queensland.

Of the 70 blood samples collected at Hermannsburg Mission, 22 were from children and 48 from adults. The following details were sent to us by Captain L. C. Lum, who collected the specimens:

> These aborigines are de-tribalized natives whose families have been living at Hermannsburg Mission for several generations; their family history is known as far back as the establishment of the mission some 65 years ago. There is no suspicion of intermixture of white blood and all the aborigines originally came from areas adjacent to Hermannsburg.

Summary.

1. Blood samples obtained from 281 pure-blooded Australian aborigines who had originated in widely scattered places in Australia were all "Rh-positive".

2. One hundred and five aborigines of group A whose blood had not previously been tested were all found to be of sub-group A_1.

3. The blood-group frequencies of 70 pure-blooded aborigines living at Hermannsburg Mission are reported.

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Bibliography.

J. B. Birdsell and W. C. Boyd: "Blood Groups in the Australian Aborigines", *American Journal of Physical Anthropology*, Volume XXVII, June 29, 1940, page 69.

J. B. Cleland: "Further Results in Blood Grouping Central Australian Aborigines", *The Australian Journal of Experimental Biology and Medical Science*, Volume VII, 1930, page 79.

K. Landsteiner and A. S. Wiener: "An Agglutinable Factor in Human Blood Recognized by Immune Sera for Rhesus Blood", *Proceedings of the Society for Experimental Biology and Medicine*, Volume XLIII, 1940, page 223; "Studies on an Agglutinogen (Rh) in Human Blood Reacting with Anti-Rhesus Sera and with Human Isoantibodies", *The Journal of Experimental Medicine*, Volume LXXIV, October 1, 1941, page 309.

K. Landsteiner, A. S. Wiener and G. A. Matson: "Distribution of the Rh Factor in American Indians", *The Journal of Experimental Medicine*, Volume LXXVI, July 1, 1942, page 73.

D. H. K. Lee: "Blood Groups of North Queensland Aborigines, with a Statistical Collection of Some Published Figures for Various Races", THE MEDICAL JOURNAL OF AUSTRALIA, Volume II, 1926, page 401.

P. Levine and H. Wong: "The Incidence of the Rh Factor and Erythroblastosis Fetalis in Chinese", *American Journal of Obstetrics and Gynecology*, Volume XLV, 1943, page 832.

R. T. Simmons, J. J. Graydon, Rachel Jakobowicz and Lucy M. Bryce: "The Rh Factor: Its Incidence in a Series of Victorian Red Cross Donors", THE MEDICAL JOURNAL OF AUSTRALIA, December 18, 1943, page 496.

A. S. Wiener: "The Rh Factor and Racial Origins", *Science*, Volume XCVI, October 30, 1942, page 407.

H. Wilson, J. J. Graydon, R. T. Simmons and Lucy M. Bryce: "The Blood Groups of Australian Aborigines" (to be published).

[1] Since preparing this paper for publication, we have been able to test a fairly large number of samples of blood from New Guinea natives. The results to date support this forecast.

SOME REFLECTIONS ON AMNESIA, PSYCHIATRIC AND FORENSIC.[1]

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WHILE contemplating a possible subject on which to address you this evening, I had in mind that this Section of Neurology and Psychiatry was formed primarily for the discussion of and interchange of views on subjects of

[1] Presidential address to the Section of Neurology, Psychiatry and Neurosurgery of the New South Wales Branch of the British Medical Association on December 14, 1943.

scientific interest, so I have chosen as a title "Some Reflections on Amnesia, Psychiatric and Forensic", trusting that this, though not meeting the requirements of the less formal or popular type of address, will nevertheless prove of some interest. Furthermore, we, as practising alienists, should, I think, reflect on the medico-legal aspects of or implications arising from the clinical syndromes with which we have to deal.

The term "amnesia", although ordinarily implying a temporary loss of memory, denotes a psychopathological state involving the aberration of both physiological and psychological functions at the highest levels of cerebral activity. It involves both the complementary functions of remembering and forgetting, which imply the capacity, or lack of it, to reconstruct by mental imagery a multitude of organized past reactions to experience, which in turn are influenced by organized sentiments and emotional factors. Remembering also includes a sense of time in the continuity of experience, a recapitulation sense and a sense of personal identity.

The most important psychological factors to be borne in mind appear to be: (i) attention, (ii) registration, (iii) capacity of perception and apperception, (iv) intensity, (v) capacity of retention, (vi) capacity of recall, (vii) mental imagery, (viii) association. Some of these factors are interdependent on one another; for example, failure of retention itself may be essentially due to poverty of association of ideas or perhaps to poverty of mental imagery. The capacity of recall appears to represent a much higher level of cerebral functioning than that of retention, and usually failure of recall precedes that of retention, in accordance with the Hughlings-Jackson concept, and is well illustrated in pathogenic amnesic states. Remembering as a whole is an active process, although the retentive factor may play a more passive role than that of recall. The activity of the latter, experienced by all of us at some time or another, is well recognized, and is sometimes conspicuous and causes us much annoyance when an idea dodges our efforts of recall.

The interplay between these activities of retention and recall and their functional defects are an interesting subject for study in some cases of aphasia. On the lower functional level the patient may recognize objects by name, but not their use. On the higher level there is an inhibition or blockage of recall, so that the train of thought proceeds without any coherent direction. Something of this latter nature appears to be a characteristic of the confabulation in Korsakoff's syndrome.

I had the experience of a peculiar disturbance of function of this nature in a male patient at a State mental hospital. I delighted in referring to his plight to visiting colleagues, for want of a better term, as an example of psychic ataxia. In this patient registration appeared to be fairly intact, but there was such marked disturbance of recall and association, that replies to questions and consequent conversation resulted in a mass of disconnected jargon, at times ludicrous in the extreme. It was difficult in this case to determine the extent of the defect of apperception. Retention was incomplete, but it was soon manifest that the patient's train of thought was side-tracked, and although appropriate words were used to express ideas, the resultant speech was meaningless, the patient having lost the power of directing his thoughts, with consequent confabulation. This patient's difficulties were dependent on an organic basis.

In those cases in which recall is psychologically inhibited we usually speak of repression. Freud states that repression always produces amnesia for something, and although we are accustomed to regard the amnesias commonly experienced in everyday life as a conflict of wishes dominated by egotistical interests, I do not think this is necessarily so; we have experience of simple lapses of recall classically exemplified in those of the absent-minded professor, which may justifiably be explained as due merely to an overcrowding of the immediate content of consciousness. It is possible that the type of recall which involves voluntary effort along associative lines may be vulnerable to the operation of psychological mechanisms; but it appears to me that the sensorimotor type functions on the physiological plane.

When one is reflecting on the influence of repression, it is of importance to differentiate between considered and unconsidered repression. The everyday psychological concept of repression implies that it is not a voluntary act. In cases of hysteria the amnesias have their origin in deep-seated subconscious conflicts, usually associated with a strong emotional element wherein the ego attempts to protect itself by an escape from reality. In considered repression, on the other hand, although a well-developed conflict may be present, it is dealt with by a consciously conditioned process, which succeeds in partially, if not wholly, resolving the conflict. However, if the emotional content in any experience in the case of persons suitably constituted is strong enough to threaten self-preservation or valued activity, the ego usually succeeds in protecting itself by repressing the memory of the experience—although the tendency for this mechanism to operate appears to be dependent on the quality of the experience and its associations. It is in these cases of unconsidered repression that we experience such a clinical variety of psychopathological sequelæ. Although the exponents of the psychoanalytical technique claim to achieve success in resurrecting infantile memories, I cannot comprehend how repression as we commonly understand it can be utilized in the first four years of life, or that at such an early age the ego can be expected to differentiate between what is or is not acceptable to its harmonious equilibrium. I should prefer to accept the doctrine that the failure of memory of early infancy is on a physical basis of imperfect myelinization of the association neurones. This brings me to the complementary fact of forgetting. It is, of course, essential that we should forget in the physiological, as distinct from the pathological sense. Mental processes that are unstable or have not reached the stage of engrammatic representation tend to overflow the banks of the stream of consciousness, and it is well that it is so, otherwise confusion would appear to be worse confounded.

From these preliminary psychological considerations it will be appreciated that the psychogenic amnesias may be explained on a fundamental hysterical basis as symbolizing a painful situation in the same manner as does amaurosis, aphonia, or paralysis, and the pattern of the amnesia may be correlated with the glove or stocking pattern of an hysterical anæsthesia, and be motivated—a concept which suffices to satisfy the tenets of psycho-pathological doctrine. It may be of interest to reflect that amnesic states are seldom, if ever, associated with amentia. This is not surprising, if we regard the hysteric as adopting the concept of forgetfulness as a symptom. It is, of course, necessary to differentiate the organic from the psychogenic amnesias. In the former case one should bear in mind association with failure of intellect of some kind, or evidence of organic cerebral disease—the more or less circumscribed nature of the amnesia—the nature of any ætiological factor, if such can be determined—and the extent of the amnesia; that is to say, retrograde amnesia after sudden onset up to a week suggests organic amnesia, and longer duration suggests psychogenic amnesia.

The type of recovery is also often significant. The organic type of amnesia is usually gradual and orderly, the psychogenic type often sudden and complete. In the latter case the amnesia often covers a wide field of the subject's personal experience. Furthermore, it is often associated with a certain apathy or indifference so far as individual responsibility is concerned for events experienced during the amnesic periods, and, last but not least, one should come to some conclusion as to the constitutional make-up of the individual.

Some authorities attempt further to differentiate the psychogenic amnesias into affective and hysterical amnesias. By the former are implied those amnesias arising from emotional shock without discoverable motives, such as might occur following bomb explosion, effect of blast, earthquake and so on; the term hysterical amnesia is then confined to cases of repression as a distinct concept.

In the amnesic states following cerebral trauma, memory usually returns gradually after the return of consciousness; in some cases the organic sensation immediately accompanying the trauma may be recalled, but there appears to be loss of mental imagery which precludes any descriptive

account of the injury. In other cases automatic actions may be performed between the time of receiving the injury and the onset of loss of consciousness, and the amnesia appears to be quite complete for this period, the automatism being conspicuous for its purposive activity. This is of interest when we consider later a case of automatism associated with epilepsy, as it is commonly accepted that the activity in the latter cases is purposeless in character.

In many of the milder, more or less indefinite traumatic cases, it is advisable to have the patient under psychiatric observation as early as possible, since it is sometimes disputed in courts of law whether complicated activity, which would pass as normal to the onlooker, is possible during a state of disordered consciousness following cerebral trauma; moreover, in addition, the clinical course of the case may be strongly indicative of structural damage, but at the same time extremely fleeting or transient, so that essential clinical phenomena may escape observation. When trauma is suspected, lumbar puncture is called for, particularly so if aphasia is also present. Some traumatic cases are of interest in respect to the suggestion that the soil may be prepared in previously tolerably stable subjects for the subsequent appearance of hysterical manifestations in response to emotional stress. The psychiatrist is frequently confronted with the necessity of determining whether in any given case amnesia is genuine or feigned. This necessity may perhaps be more prevalent in psychiatric practice in the penitentiaries and courts of law. The statement "I don't remember" in civil cases is one of more or less casual interest, but when it is advanced in the form of an amnesia as a defence in criminal cases, it is meant to convey to the jury an entire ignorance of the crime and is of considerable medico-legal significance, and in this respect alcoholism, epilepsy and hysteria are usually inculpated. It should be recalled that malingerers usually remember what is of advantage to themselves and forget what might incriminate them. They may exhibit changes of manner or tone of speech when leading questions are put to them, and often the cooperation with the examiner may be detected to be of a spurious kind. Inconsistencies may crop up in the examination, and a selective type of amnesia should always be regarded with suspicion. The criteria proposed by Norwood East as indicative of genuine amnesia in criminals are: (i) lack of motive, (ii) lack of premeditation or preparation, (iii) lack of memory of the events, (iv) lack of attempt to avoid arrest. One of the most difficult situations in assessing a feigned or genuine amnesia is met with in those cases of cerebral trauma in which the onset of the amnesia is genuinely delayed for short periods.

When amnesia is evident, in addition to the ordinary tests applied for loss of memory, inquiry should be made into the time and dates of its beginning and its end: Was it complete or fragmentary? Was it selective in character? How much did the amnesia cover the time before and after the lesion which caused it? Did the amnesic period coincide with a disturbance of consciousness? Are there present any special types of memory defect such as are exemplified in aphasic disorders? Is there any evidence of confabulation? And, if so, is it spontaneous or in response to suggestion only?

Alcoholic amnesia is sometimes a popular defence, on the principle that if it can be shown that the accused person was under the influence of alcohol to such an extent that he did not know what he was doing at the time of the crime, then the degree of punishment can be lessened—that is to say, legal irresponsibility is dependent on such a degree of alcoholism as to prevent the forming of specific intent relative to the crime; it is sometimes also associated with automatism.

The association of epilepsy with automatism and amnesia or so-called "*epilepsia procursiva*" is both a perplexing and controversial subject. In such cases there exist states of disordered consciousness, in which acts of violence may be committed for which there is no immediate subsequent memory. The history in such cases does not necessarily reveal attacks of typical *petit mal* or *grand mal*, though symptoms and signs are present which may be regarded as epileptic equivalents. These equivalents may involve character changes and aberrant types of behaviour of forensic interest and importance for such psychopathological states, by affecting conduct in such a way as to render the subject of such states less culpable. From the point of view of responsibility or lack of it, the psychiatrist has not only to determine the presence of mental disease, but also to be prepared to assess what psychological consequences have followed the existence of such a disease. Epileptic crimes in a state of automatism and associated with amnesia are not common; but the amnesia is generally complete. In determining the genuineness of the amnesia in such cases, the known facts concerning the crime and the history of the accused must be balanced against the clinical findings. The following case, of which I shall make brief mention in this connexion, is one in which I was associated as a witness for the Crown.

The accused was a female, aged about forty-five years, who had been married for fourteen years, and lived with her husband and three children. Her character was exemplary, the home life happy and she was devoted to her children. The husband and one of the children had left the house early one morning, and a relative, calling the same afternoon, had found the house locked, and noticed a strong smell of coal gas. On an entry being forced, two of the children were found in bed dead as a result of carbon monoxide poisoning, and the mother was lying with her head under the gas copper. She was removed to hospital, where she gradually regained consciousness and was under my observation. Investigation of her history revealed that she had been subject to attacks of severe headache, dulness, irritability and dizziness, on account of which she would sometimes require to lie down until these turns passed off, and at times would find herself in some situation where she was unable to recollect the events immediately preceding these experiences. The headaches were accompanied by spots before the eyes and so-called fainting attacks. She had complained to her own medical attendant of "muddled heads", and said that when she had visitors she could not follow the conversation when more than one was speaking, and that she had suffered from nightmares and dysmenorrhœa. At the time she was regarded by her medical attendant as suffering from menopausal neurasthenia. While the accused was under observation at the hospital she exhibited a certain degree of apathy, with mental hebetude and a well-marked amnesia for all events following an act of ironing on the evening immediately preceding the crime.

Some of the features outlined above were regarded as prodromata of the epileptic syndrome, and others certainly were so; this conclusion was also supported by lack of motive, lack of consideration for self or consequences, and the presence of genuine complete amnesia. It is of great importance for the psychiatrist to be present when a capital charge is laid in such cases, when the genuineness or otherwise of an amnesia will often be revealed.

When the patient was informed that a post-mortem examination had disclosed that the death of her children was due to carbon monoxide poisoning, she replied with genuine astonishment: "My children! Who gave it to them? We have no enemies." When asked if she remembered placing herself under the gas copper, she replied spontaneously: "Me! No, why should I want to do that?" She said, in answer to further questions, that she remembered only waking up in hospital and looking at the walls. When formally charged with the murder of her children, she exclaimed: "Me! You don't say that I killed my children! Me! Their mother! It cannot be true!" She then broke down, and, while sobbing, repeated: "It can't be true." By her presentation and general demeanour throughout this ordeal, there was no doubt even to a layman of the genuineness of the amnesia. I subsequently testified in the court that the accused was, in my opinion, subject to attacks of *petit mal* associated with post-epileptic automatism, that the crime was committed during a state of post-epileptic automatism, and that when it was committed, it was committed without appreciation of its nature or quality—or if there was any such appreciation, then the accused did not realize that she was doing wrong, as the condition she was in, and, in my opinion, suffering, would result in a course of action without the direction of any conscious will or intention. The accused was found "not guilty on the grounds of temporary insanity".

It is possible that in such cases as the foregoing the attempted suicide, though part and parcel of the phase of automatism, may have been appropriate to the last feeling

tone that was associated with the accused's last conscious experience. The amnesia in this particular case has, I have only recently learned on good authority, apparently remained permanent for several years past.

In epilepsy amnesic states may generally be regarded as having fairly definite limits. In the impulsive crimes associated with schizophrenia or paranoia, amnesic states are rare. In major epilepsy amnesic states following seizures are indefinite, and there may be partial recollection of events. A characteristic feature of the epileptic state is the concern and bewilderment expressed over a past period of amnesia; this is well brought out in the foregoing case and should be contrasted with the psychoneurotic state, in which little concern is displayed, by virtue of the fact that all memory is gone.

Incidentally, the association of criminality with epilepsy, or even with epilepsy and psychosis, so far as statistical surveys are concerned, appears to be of minor importance. Epilepsy and alcoholism should, however, always be regarded as a dangerous combination.

The following case is an example of amnesia associated with specific disease of the central nervous system.

The accused was a male, aged forty-seven years, who was found in his home with his head in the oven of the gas stove and a blanket covering it. The man was unconscious, and every gas jet was turned full on. In a nearby room lay the unconscious body of the eldest boy of a family of four, and the remaining three children were found to be suffering from the effects of carbolic acid poisoning. All were rushed to hospital, where the eldest boy died, the accused and the remaining children eventually recovering.

The accused was alleged to have handed glasses of lysol and wine to his children, and told them to drink it. When confronted with the details of the tragedy, the accused claimed that he could not remember anything whatever, exclaiming: "If I have done that . . . Oh, my God!"

In this case there was a similar amnesia, which was complete up to the time of the accused's regaining consciousness in hospital, but it was somewhat blurred in onset.

Investigation of his family history revealed that the father had died of paralysis, and that his sister was subject to convulsive seizures. The accused himself had been admitted to hospital at thirty years of age, suffering from loss of power on the left side. His first wife is said to have died of convulsions following a confinement about two and a half years previously; no miscarriage had occurred as far as was known. He had been remarried about four months prior to the tragedy, and the home situation was very satisfactory. He was a moderate smoker of tobacco and temperate in habits. Further investigation into his history revealed that he had informed his workmates that he was leaving, because he had sold his property for £5,000, and that he intended taking his wife and family for a trip to England. It was also ascertained that he had been making final preparations for the trip, in the way of securing a passport and his clearance from the income tax department. The accused, when questioned, denied owning any property, but could not remember making any preparations for a proposed trip, or conversation with his workmates, as outlined.

His wife, in evidence, said that he had not been in very good health of late months, and was subject to fainting attacks. He was particularly fond of his children. On examination of the accused shortly after his admission to hospital, I found him mentally dull and apathetic, with an apparently genuine amnesia and a certain degree of emotional instability. There was no definite evidence of psychosis, and no gross neurological signs of involvement of the central nervous system were discovered. The Bordet test applied to the cerebro-spinal fluid revealed a deviation of complement. I subsequently testified in evidence in the lower court that the accused was the subject of a specific disease of his central nervous system, and although his mental status was not such as to be exculpatory to the degree required by a strict interpretation of the McNaughton criteria as to criminal irresponsibility, he was nevertheless an individual with a diseased nervous system, and an impaired mentality resulting therefrom, and therefore, in my opinion, consideration should fairly be given to the above facts by the authorities concerned in determining the question of responsibility in his case.

He was committed to stand his trial, and while awaiting trial, he was certified of unsound mind; an order was subsequently made under statutory provision for his psychiatric care and treatment.

It is reasonable to conclude that in this case the amnesia was organically conditioned.

When discussing amnesia, one should not omit to mention the fugue-like states, which are fundamentally hysterical phenomena due to dissociation characterized by aimless wandering with clouding or narrowing of consciousness. The degree of amnesia following a fugue varies considerably in different cases, likewise the degree of narrowing of consciousness.

Some authors differentiate between hysterical and epileptic fugues. The hysterical fugue is regarded as a loss of memory which usually is a means of avoiding some predicament, or as a massive dissociation, in the sense that the patient wanders off away from himself and the difficulties of his own personality; the extreme cases illustrate the phenomena formerly regarded as a double personality and now largely outmoded.

A peculiar and interesting feature in connexion with these states that has always fascinated me is the tendency to habitual lying, almost at times amounting to *pseudologia phantastica*. It has been ætiologically explained as an underlying tendency to replace the realities of their unhappy childhood by wish fantasies. There is no doubt that when one probes into the individual histories of such patients, one is struck with the consistent occurrence of want of harmony or serious maladjustment in the home and parental situation. Fully elaborated case histories suggest that the occurrence of such states may be due to a special combination of psychogenic and constitutional factors combined with environmental abnormalities.

Recent studies concerning the electrical potentials of the brain open up a question for forensic psychiatry as to just how far they may assist in the administration of justice. They, of course, imply the formulation of soundly based concepts, whose practical application may ultimately be accepted by courts of law. At the present time, however, we must exercise a fair measure of scientific caution, for our conclusions are still handicapped by defects of precision which make our interpretations in certain medico-legal cases both difficult and controversial; but the value of electro-encephalography as applied to epilepsy and one or more organic conditions is becoming more and more firmly established.

It has been found, for example, that the amnesia of epilepsy is associated with an encephalogram of special character; abnormally slow and large waves with certain special characteristics are present. It may subsequently be found possible by the aid of electro-encephalography to distinguish states of amnesia with a pathological basis; consequently, when an illegal act is the result of an amnesia accompanied by a strikingly abnormal brain rhythm, medical rather than penal treatment may be indicated. It may be stated that, so far as our present knowledge goes, a normal electro-encephalogram may be accepted as presumptive evidence against a plea of epileptic amnesia.

In regard to the question of responsibility, this implies that the subject not only knows, but also appreciates, the nature and quality of his acts, including the sense of right and wrong, and has a due appreciation of the circumstances in which the act or acts are done. This latter aspect, although not specifically set out in the McNaughton criteria, is, I think, of importance in determining responsibility for criminal acts committed in an amnesic state, and it is only by a careful study of the relationship of the individual's conduct with such circumstances that the degree of responsibility can be determined. In psychiatric practice in the State penitentiaries, amnesic states are not uncommonly met with in prisoners charged with capital offences, whose characteristics are usually differentiated without much difficulty; but it is often apparent that, apart from any amnesic implications, the knowledge of wrong-doing is limited in many cases, and there is not a full appreciation of all the circumstances, so that the wrongness is underestimated.

Within recent years, one observes in the criminal jurisdiction of our courts that a much more liberal interpretation is being given to the question of respon-

sibility generally in relation to crime, and the psychiatric and legal approach to this question is becoming correlated to a realization of the degrees of responsibility that have to be decided in persons charged with crime. That the Executive Council is also sensitive to and cognizant of advanced psychiatric concepts in such matters is also evidenced by its practice in the exercise of its prerogative in such cases. A closer study of the intricacies involved in the medical concept of culpability, apart altogether from the question of responsibility, is called for, and from this it may be possible to form conclusions as to what culpability is and what treatment should be afforded subjects who are not culpable in the legal sense.

Although we, as psychiatrists, may not as yet have formulated a conception of culpability acceptable to our legal friends, we should, as close students of human behaviour, be able to demonstrate in no intangible manner those individual features in any given personality that reflect an inadequacy to meet the standards of conduct demanded by the criminal code, and to decide whether such features are predominately medical or psychiatric in origin. At the same time, we must accept the fact that the decision as to the relevancy or importance of such features in the assessment of the question of culpability or responsibility, as it directly affects the administration of the law, must ultimately be left to the wisdom of those particularly versed in the understanding and sifting of facts and their application to the question at issue. In fact, we see every day evidence of this trend, even in the courts of summary jurisdiction, where the court's decisions are wisely directed, not only to punishment, but also to such remedial measures as are indicated and available.

Conclusion.

I am sure my time and your patience must have already reached their respective limits, and although the tenor of our present existence is fast and impetuous, I trust that some little time will be spared to you for quiet reflection of the subject matter of my address this evening. As students of human behaviour in all its varied ramifications, and as psychiatrists, we should be in a position if called upon to accept the responsibility of testifying as to the respective degrees of responsibility or culpability in relation to crimes committed. We should do this, not only as it is demanded by society and through our legal institutions, but also in the true spirit of scientific inquiry and knowledge that would be expected of us as members of this special Section of Neurology, Psychiatry and Neurosurgery.

MEDICAL APPLICATIONS OF THE MAZE TEST.

By S. D. PORTEUS, D.Sc.,
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TWENTY-FIVE years ago, in its issue of January 4, 1919, THE MEDICAL JOURNAL OF AUSTRALIA published an article by Waite and Neilson,[1] which reported the mental responses of patients with hookworm infestation in north Queensland. The tests used were the Goddard revision of the Binet test and an early form of the Porteus maze tests. One hundred and sixteen hook-worm-free children were found to be 2·7 months below standard by the latter tests, whereas 64 lightly infested children were 4·7 months retarded, and in the heavily infested group of 149 cases the average deficiency was sixteen months. The tables published also indicated a certain psychomotor retardation, the infected children requiring on the average longer time to complete the tests.

Since that time the maze tests have had many applications for very varied purposes. They have occupied a leading place in racial comparisons. Primitive peoples, such as the Iliaua tribe of Australian aborigines of MacDonald Downs, were examined by Fry and Pulleine;[2] Karadjeri natives at La Grange Bay and Nyul Nyul at Beagle Bay by Piddington,[3] and Porteus;[4] Arunta and Kimberley tribes also by the writer. Gordon used the maze test among the Kikuyu and Fick used it among the South African Bantu tribes,[5] while the writer has applied the tests to bushmen of the Kalahari, Mchopi, Wakaranga, Ndau, Amaxosa, Shangaans and Bathonga.[6] Kilton Stewart, trained by the writer, collected data from among the Ainu of northern Japan, the Bajous or sea gypsies of Borneo, negrito groups on Luzon, and the Sakai and Senoi of Malaya.[7] Vicary has applied the tests to aboriginal tribes' children in Bengal.[7] Educational surveys literally from China to Peru have utilized the tests as measures of native capacity. Their use as a means of diagnosing mental defect is now quite general.

Two recent applications of the maze test in the medical field are worth calling to attention, because of the fact that they throw light on the capacities examined by the tests and thus add considerable significance to results obtained both in racial comparisons and in mental diagnosis. One of these studies, by O'Shea, Elsom and Higbe,[8] is a cooperative research undertaken by the Thompson Vitamin Clinic of the Philadelphia General Hospital, and the Division of Education and Applied Psychology, Purdue University, United States of America. This reports the results of experimental investigations of the effect of vitamin *B* deficiency, followed by appropriate therapy. These observers state: "The deficient person seems confused and apparently is less able to reason and to exhibit good judgment than under normal conditions."

In an attempt to demonstrate these disabilities, O'Shea, Elsom and Higbe applied an extensive schedule of tests including the maze test, using four subjects who voluntarily took a vitamin *B* deficient diet. After the subjects had developed the characteristic clinical manifestations of deficiency, thiamin was added to the diet, and the tests were reapplied. In a third period brewer's yeast or the synthetic vitamin *B* complex was given and the mental changes were again noted. Another group of four subjects was used as a control medium.

The results of this experiment are summarized as follows by the authors:[8]

> The subjects succeeded less well in solving the mazes when deficient than after they had received thiamine or the *B* complex. . . . When deficient, the subjects' ability to solve the mazes was inferior to that of the controls, but following therapy with either thiamine or the *B* complex, their performance was equal to, or a little better than that of the controls. . . . Furthermore, a definite relationship existed between the degree of deficiency and the degree of impairment of maze performance.

These authors also note that this impairment begins early and progresses as the deficiency deepens. The conclusion is reached that an impaired maze performance is a significant manifestation of deficiency of the *B* vitamins, though the authors are careful to state that this deficiency may not be the only factor operating in a poor maze test performance.

It is significant that apparently it is foresight and judgement of a practical nature which are affected, since general intelligence, reasoning ability and speed of hand-muscle coordination show no measurable deterioration in deficient subjects and no improvement after therapy with thiamin or with vitamin *B* complex.

In lieu of a theory that both hookworm infestation and vitamin *B* deficiency have specific effects on maze test performance, I would suggest that these and possibly other deficiency conditions interfere with brain organization through inducing incipient polyneuritis, and that a well-organized and adequately functioning neural organization is necessary for success in the maze test. Striking evidence in support of this suggestion comes from the results of bifrontal lobotomy, which interferes drastically with the coordination of functioning of the prefrontal lobes with the thalamus and hypothalamus.

This operation, instituted first by Moniz in Portugal, is rapidly becoming well known in America, following its introduction to this country by Dr. Freeman and Dr. Watts.[9] It is undertaken for the relief of certain psychotic conditions, notably in the case of psychoneurotics with anxiety states and other obsessive tensions. It has

also proved successful in some cases of *dementia præcox*. In certain selected patients the improvement is so remarkable that psychosurgery bids fair to outrank all other kinds of psychotherapy. Probably its history will be that of many another striking innovation; it will run the gamut of sceptical criticism, over-enthusiastic application and finally, conservative acceptance.

The operation consists in first drilling a trephine hole on each side of the head about six centimetres vertically above a point on the upper border of the zygomatic arch, this point being located three centimetres from the outer angle of the orbit. Through these holes, which should be on the coronal suture, a blunt knife is inserted to a depth of six or seven centimetres and a fan-like incision is made along the plane of the coronal suture and extending a little anterior to the tip of the ventricle. This cut should sever about 80% of the subcortical communication fibres running from the prefrontal regions to the dorso-medial nucleus of the thalamus and thence to the hypothalamus. The frontal cortex is, however, left intact, except at the points of entry. If the incision is too posterior, the effects are more severe; if it is too anterior or not sufficiently deep, the desired effects are not produced.

Among the results of a surgically adequate operation are temporary disorientation, mental confusion, incontinence of urine and fæces and physical inaction; but these are usually followed within a few days by a clarification of mental processes. There remain, however, in many cases, psychomotor retardation, perseveration and a lack of initiative shown in various ways. Observers also note a loss in planning capacity, particularly in respect to social judgement and foresight in more or less difficult situations. Appetite usually increases and the patient rapidly gains in weight.

Most encouraging from the therapeutic standpoint is the immediate loss of anxiety. Emotional reactions are dulled, so that some schizophrenic patients who retain delusional ideas are less inclined to do anything about them and are consequently much more socially amenable. Some subjects who previously exhibited disturbed behaviour quieten down and become much better stabilized.

The present writer, in collaboration with Dr. Kepner, clinical director of the Territorial Mental Hospital at Kaneohe, Hawaii, has now in press a monograph[10] which reports a study of the psychological and behaviour changes in twenty lobotomized patients. These subjects were operated on by Dr. Ralph Cloward, consulting neurosurgeon to the hospital, which is under the medical direction of Dr. E. A. Stephens. The patients selected for psychosurgery were carefully studied by the writer before and after operation, and the results were correlated with the hospital records supplied by Dr. Kepner. Though our results are not so favourable as those reported from the mainland of the United States of America, improvement in varying degrees from increased stabilization within the institution up to recovery warranting discharge to community life have been observed.

Some of these instances of recovery from psychosis are quite spectacular.

> The first of Dr. Cloward's patients was a particularly vicious Negro, who in the course of a criminal career extending over nearly forty years had been involved in five serious stabbing affrays and had also been convicted on other charges, such as burglary. He eventually became paranoid and was transferred from prison to the hospital, where he continued to be violent. After the operation this man became quiet, orderly and amenable to discipline, and though there were some mild psychotic residuals, he was sufficiently recovered so that he was discharged, first from the hospital and then from prison. In the course of a year there have been no criminal episodes. He can function only on a low industrial level, as initiative and planning capacity are notably diminished, but otherwise he appears to make a good adjustment.

From the psychological aspect, the effects of lobotomy are most interesting. Intellectual gains and losses are usually not pronounced, and tend on the average to balance one another, except when deterioration was already under way, in which cases psychosurgery may hasten the process. As far as our experience goes, catatonic and hebephrenic patients are not improved. Perfectionist attitudes frequently become more normal. Attempts have been made in the monograph already mentioned to explain these results along lines adumbrated in "The Matrix of the Mind"[11] and "The Practice of Clinical Psychology"[12] and to reconcile the functional and organic implications.

When the Porteus maze test performances are contrasted pre-operatively and post-operatively, the behaviouristic trends in patients are strikingly exemplified. In spite of practice effects usually noted in a second application of the maze test, the scores indicate a considerable impairment as regards planning capacity, foresight and executive ability. The mazes for the lower years are usually solved carefully and deliberately, but as soon as the tests reach a complex level these methods are suddenly forsaken in favour of a trial and error elimination of possible errors one by one. Faced with a couple of alternatives of choice of direction, the patients seem to be unable to consider these choices simultaneously. In this respect they resemble Bianchi's lobectomized monkeys, which after removal of the frontal lobes were unable to solve familiar problems if several elements necessary for solution were presented at the same time. Apparently there is an incapacity to divide the attention, so pronounced as to suggest that it is not the cortex which is, as commonly stated, the organ of choice, but the whole brain.

Since recent experiments have shown that 85% of defectives with Binet intelligence quotients below 65% have also intelligence quotients below 70% by the maze test, it is evident that a poorly organized brain such as the feeble-minded individual possesses, or a brain partially disorganized by lobotomy, means in most instances a noticeably inferior maze test performance. The lobotomized patient is like a flier who has neither co-pilot nor navigator and gets lost as soon as he is out of sight of familiar landmarks.

So characteristic is this loss in maze test ability that its non-appearance bids fair to become a crucial test of the surgical adequacy of the lobotomy operation. The surgeon is necessarily operating "blind", and it is most important to discover whether the cut is placed properly or is sufficiently extensive so that reoperation may be considered. Seventeen out of our twenty patients showed the characteristic maze test deficits, and two of these when resubjected to operation exhibited the typical responses. Furthermore, the loss in planning seems to be permanent, as repeated applications of the test bring only slight improvement, obviously due to practice, or none.

It should, however, be emphasized that this deficit in maze-solving is an index only of the surgical adequacy and not of the therapeutic value of the operation. The impairment is observable in the unimproved as well as in the improved subjects.

These results may be interpreted to mean that, though the patient may be able to function on the same intellectual plane as formerly, he cannot be expected to exercise planning either at a complex level or in new situations. He may appear reasonably well in ordinary social situations, but when the deadline of social adjustment is reached, the failure is sudden and complete. The operation is as yet too new to admit a statement of all of its neuropsychological implications; but it is hoped that before long systematic studies in this important field will be instituted and adequately supported.

In the meantime, this evidence from a new quarter as to the validity of the maze test as a measure of planning capacity is very welcome. At the time of publication of the tests 29 years ago, claims were made that the higher tests are more essentially trials of foresight, prudence and power to sustain attention.[13] In 1920, through the devising and application of the social rating scale for defectives,[14] it was shown that the maze test performance could also be correlated with initiative. Examination of the errors made by lobotomized patients shows that their tendency to make stereotyped or repeated errors is about twice that of the feeble-minded, four times that of criminals and delinquents, and many times that of normal individuals.

References.

(1) J. H. Waite and I. L. Neilson: "A Study of the Effects of Hookworm Infection upon the Mental Development of North Queensland School Children", THE MEDICAL JOURNAL OF AUSTRALIA, January 4, 1919, page 1.
(2) H. K. Fry and R. H. Pulleine: "The Mentality of the Australian Aborigine", *The Australian Journal of Experimental Biology and Medical Science*, Volume XVIII, 1931, page 153.
(3) M. Piddington and R. Piddington: "Report of Field Work in North-western Australia", *Oceania*, March, 1932, page 342.
(4) S. D. Porteus: "Mentality of Australian Aborigines", *Oceania*, September, 1933, page 30.
(5) M. L. Fick: "The Educability of the South African Native", South African Council for Educational and Social Research, Research Series Number 8, 1939.
(6) S. D. Porteus: "Primitive Intelligence and Environment", 1937.
(7) T. C. Vicary: "An Investigation into the Use of Non-verbal Tests of Intelligence in India", University of London Thesis, 1938.
(8) H. E. O'Shea, K. O'B. Elsom and R. V. Higbe: "Studies of the B Vitamins in the Human Subject. IV. Mental Changes in Experimental Deficiency", *American Journal of Mental Sciences*, March, 1942, page 388.
(9) W. Freeman and J. W. Watts: "Psychosurgery: Intelligence, Emotion and Social Behaviour following Prefrontal Lobotomy for Mental Disorders", 1942.
(10) S. D. Porteus and R. D. Kepner: "Mental Changes in Prefrontal Lobotomy", Genetic Psychology Monograph, February, 1944 (in the press).
(11) F. Wood Jones and S. D. Porteus: "The Matrix of the Mind", 1929.
(12) S. D. Porteus: "The Practice of Clinical Psychology", 1941.
(13) S. D. Porteus: "Mental Tests for Feebleminded: A New Series", *Journal of Psycho-Asthenics*, June, 1915, page 200.
(14) S. D. Porteus: "A Study of Personality of Defectives with a Social Ratings Scale", Research Publication Number 23, Training School, Vineland, New Jersey, December, 1920.

Reports of Cases.

FOREIGN BODIES AND PULMONARY SUPPURATION.

By M. P. SUSMAN,
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EVERYONE knows that a foreign body in the bronchial tree will, unless it is promptly removed, almost certainly lead to suppuration in the lung. What many doctors and dentists do not apprehend is that many a foreign body is one of the following: (i) portion of the patient's own mouth or throat that has been removed surgically, or some blood or pus, or both, set free by the operation; (ii) a piece of mucus, saliva or mouth debris, which is inhaled while the patient is under the influence of an anæsthetic agent, or sedative, for any kind of operation.

The inhalation of such intimate foreign bodies we can usually prevent or immediately counter if we observe the following rules:

1. Many teeth should not be extracted at one sitting under general anæsthesia, except for very good reasons.
2. General anæsthesia for operations on the mouth and throat calls for care and skill; an intratracheal tube should be used and the pharynx should be securely packed.
3. Suction apparatus should be available until the patient has a strong cough reflex.
4. Every removed tooth and tonsil should be accounted for. If any are missing, a bronchoscope should be passed as soon as possible; it should not be assumed that the missing object has been swallowed. (I know that often, especially in country practices, this idealistic counsel cannot be followed.)
5. If respiratory difficulties occur during or after any operation under general anæsthesia, aspiration of the tracheo-bronchial tree through a bronchoscope or catheter should be carried out promptly, unless simpler measures give immediate relief.

Extrinsic foreign bodies accidentally inhaled cause similar trouble; here prophylaxis concerns the person himself, or, if he is a child, the parents. During the last eight years the following 21 cases have come my way; I saw none of the patients until suppuration was already established in the lung. Nine of the case records have previously been reported elsewhere.[1][2] The 21 cases may be conveniently classified into three groups: (i) extrinsic foreign bodies (three cases—an oat seed, a bullet cap and a staple, respectively); (ii) inhalation of mucus, saliva or debris during or after operations under general anæsthesia (four cases; one of the operations was gynæcological, two were for removal of the appendix and one was for repair of a hernia); (iii) inhalation of a tooth or tonsil or of blood and debris escaping during the operation (fourteen cases; three tonsillectomies, eleven multiple dental extractions under general anæsthesia).

Group I.

CASE I.—B.B., aged sixteen years, inhaled an oat seed in infancy; according to the parents the oat seed was found in blood-stained pus that she coughed up ten years later. When I first saw her she had bronchiectasis of the lower lobe of the right lung, and during my absence on active service this lobe was successfully removed in Melbourne.

CASE II.—R.S., aged three and a half years, inhaled the cap of a bullet, which was removed from the left bronchus by Dr. E. Blashki, who unfortunately did not see the child until symptoms had been present for several months.[3] Because the pulmonary suppuration persisted, I removed the lower lobe of the left lung eight months after the foreign body had been removed. The boy is now quite well.

CASE III.—A.B., aged twenty-one years, inhaled a staple two and a half years before I saw him at the Beilinson Hospital, Palestine. The staple was embedded in the lower lobe of the right lung and could not be extracted through the bronchoscope. I removed the lobe, which was bronchiectatic and fibroid. Six months later he had gained two stone in weight and was well and active.

Group II.

CASE IV.—A.L., aged sixty years, developed lung infection and empyema after operation for hernia under general anæsthesia. When I first saw him he was very ill, with fever, wasting, offensive sputum and a broncho-cutaneous fistula; at operation I found necrotic lung. He died two weeks later.

CASE V.—H.R., aged twenty-seven years, had had a productive cough ever since an appendicectomy operation several years before, and bronchograms showed that he had severe bronchiectasis of the lower lobe of the right lung. It is now four years since I removed this lobe, and the patient reports that he is well and working hard as a farmer.

CASE VI.—A.W., aged thirty-three years, began to suffer from hæmoptysis, fever and productive cough soon after a gynæcological operation. Eight months later I removed the upper lobe and the apex of the lower lobe of the right lung, which were the seat of bronchiectasis and abscesses. The remaining lung tissue failed to reexpand fully, so that she was left with an infected pneumothorax in the upper half of the right hemithorax. During my absence abroad she underwent thoracoplasty, which succeeded in closing the pneumothorax space and obliterating the infection. She was well and symptomless when I saw her in November, 1943.

CASE VII.—H.B., aged twenty-eight years, developed a lung abscess immediately after appendicectomy operation. When I first examined her she was very ill, with the classical symptoms and signs of chronic pulmonary suppuration. Under local anæsthesia I drained a gangrenous abscess of the upper lobe of the right lung. This gave her temporary relief, and her condition improved; but she soon relapsed and died several weeks later from spreading lung infection.

Group III.

CASE VIII.—A.L., aged twenty-three years, fell ill soon after the extraction of many teeth under general anæsthesia. She was sent to a tuberculosis sanatorium, but no tubercle bacilli were ever found in the sputum, and she came to me for further advice two years after the onset of her trouble. She had a constant productive cough and suffered from attacks of hæmoptysis and fever. Bronchiectasis and abscesses were present in the upper lobe and apex of the lower lobe of the right lung, and I excised these parts of the lung. The patient had a slow and trying convalescence, but was in fairly good condition when I saw her for the last time about five months after the operation. According to her mother, she was stricken with pneumonia of the left lung six months later, and died within a few days.

CASE IX.—V.S., aged forty-one years, developed an abscess in the upper lobe of the right lung soon after tonsillectomy. On several occasions I aspirated bloody pus through the bronchoscope, and this gave him temporary relief. Later, open drainage of the abscess brought improvement but not cure, and bronchograms showed that residual bronchiectasis was the cause of the persisting cough and sputum. He refused lobectomy, and I lost trace of him; but I heard that two years later he still had a productive cough and intermittent hæmoptysis.

CASE X.—R.D., aged twelve years, was admitted to hospital suffering from a putrid abscess in the upper lobe of the left lung secondary to tonsillectomy and whooping cough. He improved rapidly after drainage of the abscess, and his general condition is now good; but he still has an occasional productive cough, and an opacity persists in the radiographs.

CASE XI.—B.T., aged twenty-one years, came under my care suffering from advanced bronchiectasis of the lower lobe of the right lung. Evidence of lung suppuration appeared soon after the extraction of some teeth under general anæsthesia; the patient said that six months later she coughed up a tooth. Dr. D. G. Carruthers gave her appreciable relief by repeated bronchoscopic aspirations, and he later sent her to me for lobectomy. This operation she underwent several months ago, and she is now well and symptomless.

CASE XII.—E.H., aged twenty-nine years, had a history of pulmonary suppuration of one year's duration following tonsillectomy. Chronic suppurative changes were present in the upper lobe of the right lung, which had spread to the middle and lower lobes, so that total pneumonectomy was necessary. She died from shock the same night, in spite of blood transfusion and the administration of oxygen.

Cases Previously Reported.

The following are brief summaries of the nine cases that have already been reported.

CASE XIII.—M.W., aged twenty-seven years, had putrid bronchiectasis and constitutional symptoms of toxæmia. Bronchograms revealed saccular bronchiectasis of the lower and middle lobes of the right lung. During a bronchoscopic examination I removed a tooth from the depths of the right bronchus (the patient could recall no trouble after the removal of most of her teeth several years earlier). She died a month after the removal of the lower and middle lobes, and at autopsy a number of septic infarcts were found in the opposite lung.

CASE XIV.—N.J., aged twenty years, had a tooth removed from the right lower lobe bronchus by Dr. R. Murphy eleven weeks after the extraction of some teeth under general anæsthesia. He continued to cough up purulent sputum and blood, so I performed a two-stage lobectomy. After a complicated convalescence he recovered completely and was well when I last heard of him.

CASE XV.—T.D., aged forty-two years, had gross bronchiectasis of the lower lobe of the left lung; the right lung was normal. He was edentulous, and his illness had dated from the extraction of all his teeth two years earlier. He died ten days after the removal of the lower lobe of the left lung, which was bronchiectatic and fibrotic throughout. At autopsy the lower lobe of the right lung was gangrenous, and an old tooth lay in the bronchus; apparently it had lain undetected in the lower lobe of the left lung for two years, until, during the removal of this lobe, it had been dislodged into the trachea and so into the right bronchus.

CASE XVI.—E.P., aged twenty-six years, became ill with fever and cough soon after the removal of some teeth under general anæsthesia; the sputum rapidly became purulent and offensive. She recovered after open drainage of a large abscess in the upper lobe of the right lung, and has remained well since.

CASE XVII.—E.H., aged fifty-four years, had had all her lower teeth removed under general anæsthesia thirty years before. Ever since then she had had a cough productive of offensive sputum which was blood-stained at times. Two years after the dental operation she had coughed up a tooth, and she had twice suffered from empyema of the right pleural cavity. Bronchograms revealed bronchiectasis of the lower lobe of the right lung. Cautery lobectomy in stages gave great relief.

CASE XVIII.—M.J., aged thirty-two years, had suffered from cough, foul sputum, constant fever and general ill health for eight months; her illness dated from the extraction of 24 teeth under general anæsthesia. Her condition improved temporarily after drainage of an abscess of the lower lobe of the right lung; but she soon relapsed, and she died six months later from multiple abscesses in both lungs.

CASE XIX.—L.B., aged fifty-three years, fell ill with "pneumonia" five weeks after the removal of all her teeth; during this illness she coughed up a tooth. Cough, foul sputum and pain in the chest persisted, and her health deteriorated. Clinical and radiological examinations revealed an abscess in the upper lobe of the left lung. With general treatment and repeated bronchoscopic aspiration her condition gradually improved, and at last she recovered completely.

CASE XX.—A.S., aged thirty-four years, had all her teeth extracted under general anæsthesia. She felt ill from the day of the operation, and two weeks later she developed a cough with fever and rigors; soon she was bringing up foul, blood-stained sputum. The seat of the trouble was the lower lobe of the right lung. Her condition improved with bronchoscopic aspirations, and she then returned to her home town to continue this treatment.

CASE XXI.—D.R., aged twenty-five years, began to cough up offensive sputum soon after the removal of 28 teeth under general anæsthesia. I first saw her eight months later, when she produced six ounces of sputum per day; but she had few constitutional symptoms. I found that the bronchus to the middle lobe of the right lung was blocked with thick secretions and swollen mucous membrane. Five times I aspirated pus from the middle lobe through the bronchoscope; the daily amount of sputum soon decreased, and the radiological opacity disappeared. She was well when I saw her two years later.

Summary.

Here is a series of 21 cases of pulmonary suppuration secondary to the inhalation of something into the bronchial tree. In three cases only was it an extrinsic foreign body; in the remaining eighteen it was some of the patient's own blood or secretions, or a piece of his own body. Seven of the patients died, and all of them belonged to either Group II or Group III; but the total number of cases in the whole series is too small to be of any statistical value. One of the seven deaths was due directly to operation (Case XII). Another was indirectly due to operation, a tooth being displaced from the diseased to the sound lung (Case XV). One was due to late pneumonia of the opposite lung, and it is not possible to determine whether or not the earlier lung suppuration was a factor (Case VIII). The remaining four deaths were due to spread of the infection in the respiratory tract in spite of operation (Cases IV, VII, XIII and XVIII). Methods of treatment have been outlined in the different case records, and the main means of prevention have been stressed at the outset.

References.

(1) M. P. Susman: "Pulmonary Lobectomy for Bronchiectasis", THE MEDICAL JOURNAL OF AUSTRALIA, August 26, 1939, page 319.
(2) M. P. Susman: "Foreign Bodies and Pulmonary Suppuration", *The Journal of the Old Sydney Hospitallers' Club*, December, 1939, page 30.
(3) E. P. Blashki: "Foreign Body in the Lung Recovered by Means of Two-Plane Fluoroscopy", THE MEDICAL JOURNAL OF AUSTRALIA, February 24, 1940, page 270.

SUBPERITONEAL FATTY HERNIA.

By W. R. GROVES, M.D., F.R.A.C.S.,
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VERY little appears to have been written about fatty hernia, so it is hoped that the reporting of three cases, in each of which the hernia was in a different situation, may be worth while.

Case I.

In the first case the lesion was a small epigastric hernia; the patient was operated upon many years ago. I remember that the hernia was a collar-stud-like protrusion of the subperitoneal fat through a small aperture in the *linea alba*, which had caused discomfort for some considerable time. There was no accompanying peritoneal sac, and it was noted that the small lump was as fibrous as it was fatty—much more fibrous in nature than the subperitoneal fatty layer from which it arose.

Case II.

In the second case, the hernia occurred in the right groin of an elderly man. It had started as a small lump many years before and had gradually attained the size of a pigeon's egg. It had caused increasing discomfort, was irreducible, and gave only doubtful impulse on coughing.

At operation, a small fibro-fatty lump was found protruding through a distinct rounded aperture in the floor of the mesial half of the inguinal canal. No peritoneal sac or bladder wall was found in the pedicle, and this on ligation and division slipped back into the subperitoneal space.

Here, again, the fibrous character of the herniated fatty tissue was noted. That its origin must have been closely related to the bladder, as might have been suspected from its position, was proved by a statement made by the patient after his recovery. He said he was quite relieved of urinary symptoms, which had worried him for a long time. If witnessing a football match, for instance, he would have to retire to the urinal at least two or three times during the game, and would have the greatest difficulty in starting the flow if anyone happened to be standing near by.

Case III.

The third case occurred recently; the hernia proved to be in the femoral region, the patient being an elderly man sent to hospital as suffering from a strangulated hernia. A lump had been present in the right groin for some years; thirty-six hours prior to my seeing him it had suddenly become painful. Repeated efforts to reduce the hernia by taxis had proved unsuccessful. The patient had vomited twice, but not for some hours, and his general condition did not accord with that expected in a case of strangulated hernia of such duration.

At operation, a strangulated fibro-fatty hernia, the size of a small fig, plum-coloured and lying bathed in brownish fluid, was encountered without my apparently having opened any definite sac. Its pedicle, the thickness of the little finger, was nipped at the crural ring. After Gimbernat's ligament had been incised and the constriction relieved, the pedicle could be drawn down only a very little. The finger, however, readily passed into the space above the crural ring, and could be swept freely around it mesially, anteriorly and posteriorly, but not laterally. When an opening was made through the floor of the inguinal canal above, peritoneum was found adherent to the lateral aspect of the pedicle, traction on which caused a small peritoneal pouch to be dragged into the crural ring. Why the peritoneum should have been situated thus laterally rather than within the pedicle seems to require explanation. Having satisfied myself that no bladder wall was present, I ligated and divided the pedicle, and Poupart's ligament, which was lax, was sutured to the fascia over the pectineus, the crural ring being fairly satisfactorily obliterated.

The fibrous nature of the fatty hernia was noted in this case, developed, no doubt, as a consequence of long-standing irritation.

Discussion.

In a search for references I found very little written about such cases, what there was being limited in most works to the condition commonly called epigastric hernia. At the same time, I found a confusing variable use of the terms "properitoneal", "preperitoneal", "extraperitoneal", "subperitoneal" and "subserous". For instance, epigastric hernia was quite often called properitoneal hernia, whereas elsewhere properitoneal hernia was defined (I should say correctly) as that form of peritoneal hernia that comes to lie between the peritoneum and *transversalis fascia*, one of the forms of interparietal hernia. It would perhaps better be dubbed "subperitoneal", along with all other structures so situated. The only reference I could find to fatty hernia occurred in "Rose and Carless' Manual of Surgery". In the 1937 edition, the term "fatty hernia" is found, not in the section on hernia, but in that on lipoma (Volume I, page 193); this section is repeated word for word in the latest (1943) edition, as follows:

> . . . localised growths often occur in the sub-peritoneal fatty tissue constituting subserous lipomas. They are not infrequently found in the lower part of the abdomen and may extend into the inguinal and crural canals. By their traction a process of peritoneum may eventually be drawn down and a true hernia produced. A similar condition occurs in the anterior abdominal wall, small pedunculated masses of fat projecting through congenital or acquired openings in the *linea alba*, often just above or below the umbilicus or in the *linea semilunaris*; these, which are not usually neoplastic in nature, are nown as "Fatty Hernia" of the *linea alba* and are often painful.
>
> Occasionally the connective tissue of a lipoma undergoes modification, e.g., it may become increased in amount and fibrous in character. . . .

In the 1943 edition of the same work (Volume II, page 1362), in the section on hernia, the term "fatty hernia" again appears, but only under the heading of "ventral hernia", as follows.

> . . . Several forms may be met with. It consists not uncommonly of a protrusion of subserous fatty tissue through a congenital or acquired opening in the *linea alba, linea semilunaris,* or *linea transversa,* especially at the junction of the last with the former. They are more common above than below the umbilicus, and if, as not unfrequently happens, the fatty tissue proliferates a localised tumour resembling a lipoma is produced, which goes by the name of a fatty hernia of the *linea alba.*
>
> A portion of the peritoneum is drawn through the opening into the centre of these masses after they have persisted for some time, and a true hernia is thus induced. . . .

This description would, and no doubt does, apply to the condition commonly called epigastric hernia; yet, strange to say, neither in the index nor in the text of this recent standard work is the term "epigastric hernia" to be found.

Conclusion.

If, in a limited surgical practice, it has been my lot to encounter three cases, fatty hernias must occur much more commonly than one would infer from the very meagre references to the condition to be found in the literature.

This, I hope, justifies an endeavour to throw a little more light on a clinical entity that seems not to have received the attention it deserves.

Acknowledgement.

I should like to add my appreciation of Miss N. Andrew's assistance in making for me a search in the Gordon Craig Library.

Reviews.

RADIOGRAPHIC TECHNIQUE.

A BOOK dealing with radiographic technique has been prepared by the Technical Service Department of the General Electric X-Ray Corporation and edited by Glenn W. Files, Director.[1] The authors have had extensive radiographic experience, and this result of their collaboration should be of great value to technicians and to medical men engaged in radiology.

The early part of the work deals with the various electrical problems of potential current, magnetic induction *et cetera*; these complex subjects are dealt with lucidly and concisely and numerous graphic illustrations add to the value of the subject matter. The modern X-ray tube and the rectifying valve are described and the ratings of the various models are given in chart form. All types of X-ray generators are dealt with, and the electrical problems of each are discussed in simple language. The importance of "shock proofing" and efficient timers is stressed.

The chapter on calibration should be of great value to the engineers engaged in this work; the importance of such calibration cannot be overestimated, as it allows the use of a complete milliampere-second procedure over the whole output range of the generator. Darkroom procedure is detailed, and this chapter could with advantage be read at regular intervals even by the most skilled technician. A short section on anatomy is very elementary, but quite sufficient for the purpose.

The most important part of the work consists of an excellent series of photographs showing the position of the patient, tube and film in the taking of radiographs of every region of the body. A description of the position is given below each picture, together with suggested exposure factors and a sample radiograph of the region examined.

If this book could be distributed through X-ray departments generally, there would be no excuse for the production of bad films.

[1] "Medical Radiographic Technic", prepared by the Technical Service Department of General Electric X-Ray Corporation, under the supervision of Glenn W. Files, Director, in association with various contributors; 1943. Springfield: Charles C. Thomas. London: Baillière, Tindall and Cox. 10" x 7", pp. 369, with many illustrations. Price: $6.00.

The Medical Journal of Australia

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WOMAN IN INDUSTRY.

DURING the last few decades the position of woman in the community has undergone a continuous and gradual change. The war of 1914-1918 accelerated the change, for woman was compelled to engage in occupations vacated by men who entered the fighting services and to undertake duties incidental to the conflict itself of which she had had no previous experience. When the war was over, war-time factories closed and men returned to take up their pre-war jobs. This meant that women had to readjust themselves once more. Many returned to their duties in the home and many more found a niche for themselves where they could maintain something of their wartime independence and earn their own livings. But conditions did not revert to what they had been before 1914. What some people call the emancipation of women, what others describe as the feminine invasion of industry, and what others again regard as the normal evolutionary process inseparable from the times in which we live, had progressed a step further. Now, when total war has been forced upon the nation, woman has once again answered the call and is giving first-rate service in military units, in factories concerned directly with the production of war material and in civilian industries. Not unnaturally many persons ask themselves how far this emancipation, this feminine invasion, this evolutionary process, will eventually go. Some think, perhaps wishfully, that a new set-up of society is coming into being in which woman will have equal privileges and responsibilities with man, in which every woman, married or single, will be engaged in some useful occupation, preferably in industry. As the arguments for and against this kind of arrangement, though interesting, are not essential to our present discussion, they will not be pursued. The time has long passed when woman was man's chattel, and it is important to our present discussion to remember that woman has become more and more man's creditor and he her debtor, that she is less than she ever was his dependant and is in inverse ratio his co-worker. What concerns medicine is that woman shall be mentally and physically fit for what she is called upon to do.

In medical and other literature reference is often made to the physical endurance that may be displayed by woman and to the amount of work that she can do in many different kinds of undertaking; authors confess to a certain amount of astonishment at both. A healthy woman's capacity for work, like that of a man, is largely the result of training, and is, of course, dependent on her stature and general build. People are astonished at what woman can do from the physical point of view, chiefly because in British communities she is spoken of as representing the weaker sex and is not generally expected to engage in laborious work. This brings us to the indisputable fact that as a would-be active member of an industrial unit woman is severely handicapped. For a single woman the position is not so bad; but for a married woman—and there are large numbers of married women making a most praiseworthy showing in industry today—the handicap is great. She is expected to do two jobs. Before she leaves home for work in the morning and after her return in the evening she has to see to the running of the home, and the care of the children is almost entirely her affair. We may be quite certain, too, that, if the woman is conscientious, her home and her children are seldom out of her mind and mental strain is added to the physical. That continuous work has an effect on the central nervous system as well as on the muscular system is undeniable; with the double allegiance to home and workroom the effect may be considerable. In the past husbands were not often prepared to share with an overworked wife the burden of running the home; nowadays in the stress of war they are becoming more reasonable. This whole question is enormous. It may be discussed from the general point of view of a peace-time *régime* and of future development—and here the question of the extent to which woman should enter the ranks of industry would need to be dealt with from the Australian aspect. The subject may also be regarded from the point of view of wartime emergency in which woman will give of her very best, perhaps to an extent which in peace time she would not regard as fitting, but with the knowledge that she is making an extra effort for the purpose of winning the war. But whatever approach we make—and the latter is the more fitting at the moment—we must remember that a woman is a woman and must not be denied her womanly functions and aspirations. Her double job when she enters the ranks of industry has been mentioned. We must remember that the maternal instinct is very strong. Most women at some time or other want to have children, and they should not be denied; it is also in the interests of society that the maternal instinct shall be satisfied. In these circumstances it is the duty of medicine to see that woman's bodily health is maintained at such a level that she will be able to fulfil her destiny. On that point everyone ought to agree, from those who regard woman only as a home-maker and the mother of a family, to those who would give her absolute freedom in the choice of a "career". And after all a healthy mother and a healthy industrial worker are much more likely to give a satisfactory account of themselves than those who are sickly and given to complaining in various ways.

Under Utopian conditions every person, man or woman, entering industry would be medically examined to determine the fitness of the individual for the job and of the job for the individual. In addition there would be such a complete supervision of industry that general unsuitability or the appearance of some abnormal condition would be an indication for a variation of the job or in severe cases for cessation of employment. This means that full effect would be given to the requirements of industrial hygiene. In such a supervision opportunity would arise for study of the effects on woman of different factors or types of employment. The need for such a study is emphasized by many writers on this subject and is one reason why the whole subject has been brought up for discussion in the present instance. G. C. Schauffler in a paper on women in war work[1] is insistent that basic studies have not been made, and much the same view was expressed by authors who took part in a symposium held by the Section on Obstetrics and Gynecology of the American Medical Association.[2] Though the papers in the symposium are perhaps rather on the academic side and contain statistical data that deal only with conditions in the United States, they will well repay perusal. One or two of the more important features may be mentioned. Kronenberg holds that the wholesale employment of women without some caution in selection will result in high labour turnover and absenteeism. Experience has shown this to be true. Generally speaking, also, the selection and training of women are often more difficult and present greater problems than those associated with the employment of men. Schauffler is downright in his views. He believes that the absolute essential to progress rests in the establishment of a thorough system of "preplacement medical examination" with a complete follow-up system. In his opinion workers are willing to see such a system inaugurated, but employers are apathetic. Hesseltine refers to a report published by the Committee on the Health of Women in Industry of the Section on Obstetrics and Gynecology of the American Medical Association in the journal of the last-mentioned body on March 13, 1943. This committee stated that preplacement physical examinations should be complete and "should be used only for the purpose of assigning work adjusted to the physical and temperamental fitness of the applicant and to maintain safe and healthful employment for all employees". The committee also states that from the obstetrical and gynæcological point of view "the opportunity is too good to be missed for as thorough an evaluation of the system as possible". It will be admitted that a thorough examination may reveal an early but serious lesion of the breast, uterus or adnexa, and also that other conditions may be revealed which are less serious, but which should be reexamined at regular intervals as a health measure for the employee. It will also be admitted that to know the details of the gynæcological history of every employee would be useful and in the long run to the employee's advantage. At the same time it sounds something like the state of affairs in which "there is nothing covered, that shall not be revealed; and hid, that shall not be known". The truth of the matter is that in this, as in every other venture in preventive medicine, common sense must be exercised. This would hold even under the Utopian conditions already mentioned. We have no doubt that the members of the American committee would agree that in the case of a sturdy young woman about to enter industry who had never been ill and whose menstrual history was normal, there would be no need to make a complete examination. To do so would be to direct attention unnecessarily to the generative system and to pave the way for a psychological trauma. Barlow states in his contribution to the symposium that a complete pelvic examination is never made at any of his preemployment examinations (he is medical director of an aeronautical corporation); if a thorough examination is necessary the woman is referred to her family doctor for this purpose. This arrangement would in Australia be regarded as ideal.

When it has been determined that a woman is fitted by reason of bodily health and mental equipment to become a worker in an industrial undertaking, the next thing to do is to see that she has work to do that is within her powers. The industrial medical officer should have some say in this allotment. Kronenberg holds that jobs should be classified in regard to the skill and the physical strength required for their completion and also in regard to the health and safety hazards. It stands to reason that if this is done the choice of work suitable for a given employee will be the more easily made. At present women often take over the work of men and thus certain adjustments may have to be made in machines, tools and equipment to compensate for woman's different stature and strength. In regard to other aspects the general principles of industrial medicine must be applied. In the maintenance of the health of women engaged in industry facts yet to be discovered in connexion with different forms of industrial activity will have to be applied. Burnell in his contribution to the symposium discusses with understanding the maintenance of health. He lays stress on emotional adjustment and thinks that the activities of a "counselor" (presumably a welfare officer) are most valuable. He thinks that the success of any attempt to maintain the health of women in industry depends on the extent of the "fact finding" by the industrial medical officer and on the cooperation of the private practitioner. In this regard readers are reminded of our recent discussion on industrial medicine in which it was suggested that the general practitioner with access to factories and workshops should try to make himself familiar with the type of work done and the conditions under which his patients have to work. In his work for women he will feel much better equipped to give advice if he knows how they work and what they actually do. The family doctor has a better insight than anyone else into the two-job burden carried by the women under discussion; he is better equipped than anyone else to be their counsellor and guide. If he does nothing else he can make the working of the home run smoothly by seeing to it that the husband, the son or the brother has insight into the difficulties faced by the woman. Understanding and a little practical help for the woman will be a greater stimulus to her than anything else.

[1] G. C. Schauffler: "Women in Heavy War Work", *Western Journal of Surgery, Obstetrics and Gynecology*, January, 1944, page 12.

[2] M. H. Kronenberg: "Working Conditions for Female Employees"; M. R. Burnell: "Health Maintenance Program for Women in Industry"; F. A. Barlow: "Proper Placement of Women in Industry"; H. C. Hesseltine: "Specific Problems of Women in Industry"; *The Journal of the American Medical Association*, March 11, 1944, page 677.

Current Comment.

TRAUMA OF THE LARYNX.

THE larynx receives brief mention in text-books dealing with traumatic surgery. It is therefore important to note the contribution of such authorities as Chevalier and Chevalier L. Jackson when they attempt to fill the breach with a paper which proffers the lessons of a wide personal experience and the application of a number of those principles which they themselves have often expounded as a result of their well-known studies of the larynx and respiratory tract.[1] While relatively uncommon, serious laryngeal injury may arise from a variety of forms of violence. A brief enumeration of causes of laryngeal trauma in their personal experience renders it evident that it may fall to the lot of any practitioner, and especially of casualty surgeons, and surely of military surgeons, to have to deal with such a case. An appreciation of the immediate dangers to life and of subsequent disastrous consequences makes it desirable that all should be familiar with a rational plan to be followed if life is to be saved and later functional disabilities are to be avoided. Fracture of the framework of the larynx, contusions, punctures and lacerations are the forms of injury. Three classes of condition peculiar to the larynx are to be distinguished: (*a*) those in which the cartilage and its perichondrium are uninjured, (*b*) those in which those structures are damaged, (*c*) those in which the hypopharynx or the cervical portion of the œsophagus is involved. Prognosis and treatment in a particular case will vary as it falls into one or other of these three classes. In the first of these groups uncomplicated recovery is the rule; in the second, perichondritis with prolonged suppuration, cartilage necrosis and fibrous contractions are to be anticipated; in the third type sloughing and foul suppuration readily supervene.

Occlusion of the airway may occur rapidly without inflammation, and such is the limitation of the natural sufficiency of the laryngeal lumen that there is but little reserve and asphyxia may occur from no great mass of swelling. Œdema, hæmorrhage or hæmatoma, or submucosal emphysema may produce occlusion long before any inflammatory reaction takes place. Symptoms such as hoarseness, aphonia, wheezing, hissing or stridulous respiration, hæmoptysis, cyanotic colour or ashen grey pallor may suggest laryngeal damage. Diagnosis is made by palpation, by mirror or direct laryngoscopy and with the assistance of X rays. Asphyxia, hæmorrhage, aspiration pneumonia, mediastinal emphysema, sepsis and cartilage necrosis are the immediate or early dangers. Laryngeal stenosis and total atresia are the later disasters to be guarded against.

The treatment of shock and indications for transfusion are the same as for injuries in general. The use of morphine should be restricted because of its depressive effect on the respiratory centre and its inhibition of the cough reflex. The outstanding features are concerned with the problems of asphyxia, hæmorrhage and laryngeal stenosis. Tracheotomy is indicated in practically every trauma of the larynx and may be deferred only if the patient is under constant observation and an operator is promptly available. Indrawing of the suprasternal notch is an indication for urgent operation. So that the larynx may be packed or compressed from within by an obturator and to prevent drowning from hæmorrhage, tracheotomy is essential. To prevent or to relieve emphysema, either cervical or mediastinal, the operation is effective. Through the opening, too, blood may be aspirated, oxygen may be administered and pulmonary complications may be relieved by frequent bronchoscopic or catheter aspiration. The wound in the neck and damage to the larynx, either immediate or potential, may be treated on sound lines only if an independent airway is first established. The operation should always be done low, a few uncut tracheal rings being left between the opening and the larynx. *Débridement* of the wound should be extremely conservative, as almost any viable tissue is of value to repair the larynx and subsequently to maintain an airway. Care should be taken that further cartilage is not devitalized by separation from the perichondrium. On the other hand a completely denuded or detached fragment of cartilage will certainly never survive because the wound is not sterile; a fragment is certain to become a pyogenic sequestrum. Sulphonamide powders are of value, but should be lightly applied as a very fine dust, great care being necessary to avoid the passage of lumps into the lower air passages. Following any crush, fracture or dislocation of the laryngeal box, it is of prime importance that the surgeon should appreciate from the outset that apart from the saving of life, the whole future functioning of the larynx depends upon prompt and proper care; these two objectives must be kept separately and clearly in mind. The Jacksons stress the use of pure rubber core-moulds which are placed within the lumen of the larynx and serve as internal splints. Early use of these moulds is imperative because deformity will otherwise soon become fixed. When trauma of the interior of the larynx has occurred, it is reasonable to wait until necrotic tissue has sloughed off and raw surfaces are covered with healthy granulations; epithelialization should not be awaited, however, before the moulds are used. Unless infection is exceptionally virulent, insertion of the moulds is usually practicable after a week or two of sulphonamide treatment. The mould selected should be fairly close fitting, and larger sizes should be inserted as swelling subsides. In neglected cases when cicatricial stenosis has occurred, and when any sort of a lumen remains, core-moulds are again recommended and have proved so successful that operations such as division of the cartilages have been avoided. When the pharynx or cervical portion of the œsophagus is also injured, the constant use of a tube passed through the nose and well into the thoracic portion of the œsophagus is stressed in order to provide drainage, to enable proper feeding to be maintained and to avoid the spilling of food into the larynx or adjacent cellular planes. Bronchoscopic aspiration will in most instances prevent the development of pneumonia or pulmonary œdema and may be necessary especially in endolaryngeal burns in which there is a tendency for a thick tenacious secretion to form in the larynx and trachea.

When trauma of the larynx has occurred the attendant medical officer will, if he is wise, seek the assistance of a skilled laryngologist. Skilled assistance may not always be available, and therefore it behoves practitioners generally to have some knowledge of the appropriate treatment.

[1] *Archives of Otolaryngology*, November, 1943.

ABSCESS OF THE SPLEEN.

IN reporting a case of abscess of the spleen,[1] I. N. Wolfson states that three modes of pathogenesis are generally recognized. Traumatic abscesses constitute 15% of all splenic abscesses. Clinically they result from trauma to the organ which is followed by perisplenic hæmatoma. They have also been produced experimentally. Splenic abscesses may result from extension from a neighbouring process, but the most important group comprises those resulting from the metastatic spread of infection elsewhere. This group, Wolfson holds, must be divided into those in which infection spreads along venous channels (usually associated with intraabdominal suppuration) and those in which infection reaches the spleen through the femoral artery. Wolfson's case belongs to the first of these groups. The abscess had its origin in "periappendicitis", and at operation pus was found to be partly within and partly outside the spleen. In spite of drainage the patient died. At autopsy extensive involvement, including the portal vein and liver, was found. Splenic abscess is an "infrequent but not rare" condition; diagnosis is all-important, and should not be difficult if the possibility of the lesion's occurrence is borne in mind. The clinical examination and the history should point in the right direction and exploratory laparotomy may be necessary.

[1] *The New England Journal of Medicine*, February 3, 1944.

Abstracts from Medical Literature.

GYNÆCOLOGY.

Granuloma Pyogenicum of the Cervix Uteri.

R. P. MORBHEAD, W. E. WOODRUFF AND W. C. THOMAS (*American Journal of Obstetrics and Gynecology*, April, 1944) report a case of *granuloma pyogenicum* of the *cervix uteri*; they have been unable to find any previous report of such a case. The patient was aged twenty-one years, and was pregnant for the second time, the previous pregnancy and confinement having been normal in every way. During the third month of the present pregnancy vaginal hæmorrhage occurred, but examination revealed no cause. No further hæmorrhage occurred until near term; hæmorrhage then became rather profuse and a vaginal examination revealed a bright red growth on the posterior lip of the *cervix uteri*. The growth was elevated about eight millimetres above the surface and measured one centimetre in diameter; it was excised widely, and later studied. The patient was delivered on the same day; the puerperium was uneventful, and there was no recurrence of the lesion. Laboratory examination of the tumour revealed, amongst other things, a pronounced decidual reaction in the cervix; this, the authors consider, is of extremely rare occurrence. They are unable to state with certainty that any relationship exists between *granuloma pyogenicum* of the *cervix uteri* and pregnancy; but they consider that the imbibition of the cervical tissues associated with pregnancy may provide a fertile soil for the staphylococcus, which is probably the causative agent. It is possible that many of the cases of inflamed polypi associated with frank decidual reactions in the cervix that have been reported were really cases of *granuloma pyogenicum* in which a wrong diagnosis had been made. The error may have been due to the examiner's unfamiliarity with the disease, or to the condition of the specimen at the time of its arrival at the laboratory. The diagnosis should be made clinically, for the lesions are characteristic. If the pathologist receives the entire tumour, the microscopic picture is also pathognomonic; but if the specimen is received in a fragmentary or distorted condition, the diagnosis is likely to be missed.

Management of the Climacteric with Ethinyl Œstradiol.

R. A. LYON (*American Journal of Obstetrics and Gynecology*, April, 1944) has studied the value of ethinyl œstradiol in the management of the menopause. Forty-five patients were treated throughout 348 cycles; the patients had complained of hot flushes and other menopausal symptoms for an average period of three years. They were first of all studied prior to treatment through a control cycle and then through a varying number of cycles during œstrogen treatment (from three to 24 per patient). Ethinyl œstradiol was given by mouth in the form of enteric-coated tablets, each containing 50 microgrammes; it was administered for twenty-one days, and was then withheld for seven days. After six such cyclic treatments, the œstrogen was again withheld, this time for one month, and an evaluation of the various components of the syndrome was made. Usually a continuation of the treatment was indicated. The author did not determine whether ethinyl œstradiol therapy hastens, postpones or is without effect on the achievement of eventual symptomatic equilibrium. Some mild transitory sequelæ occurred at some time during treatment in a few cases.

Salmonella Infection of the Fallopian Tubes and Ovaries.

H. C. FALK AND G. BLINICK (*American Journal of Obstetrics and Gynecology*, April, 1944) state that human infections with the Salmonella bacilli have been reported much more frequently in recent years. Improvements in bacteriological technique have revealed that such infections may produce a variety of clinical syndromes, not merely "food poisoning". The authors add to the few pelvic infections already reported, two cases of salpingo-oophoritis caused by a Salmonella bacillus. In one of these cases, a Salmonella was for the first time isolated from the fæces. The route of infection is still in doubt, though infection via the blood stream (possibly to previously infected Fallopian tubes) is considered likely. The fact that positive results were obtained to agglutination tests suggests that the Salmonella bacilli are of ætiological significance in the causation of pelvic infection and are not accidental contaminants. The manifestations of such infections are not clinically distinctive; the diagnosis can be made with certainty only by bacteriological and immunological methods. The treatment appears to be the same as that of salpingitis caused by other bacterial organisms, such as the gonococci.

Biological Characteristics of the Normal Vagina.

A. E. RAKOFF, L. G. FEO AND L. GOLDSTEIN (*American Journal of Obstetrics and Gynecology*, April, 1944) have studied the biological characteristics of the normal vagina. The clinical material consisted of more than 500 subjects, of whom 37 were normal women; studies of the latter were made three times a week through one to three menstrual cycles. Although the œstrogens are the major factor in controlling the histological and cytological features of the vaginal epithelium, evidence is presented that progesterone and possibly other steroid hormones have an important influence. Present evidence indicates that the œstrogens dominate the mobilization of glycogen in the vaginal epithelium; progesterone may aid in the process. Androgens seem to have an inhibiting effect on glyconeogenesis. Glycogen is found in abundance at vaginal biopsies; the metabolism of vaginal glycogen is not known with certainty. It was found that the glycogen content of the superficial vaginal epithelium showed a tendency to increase throughout the menstrual cycle and then to fall in the late premenstrual phase, thus approximating the œstrogen excretion through the cycle. Direct determination of the pH of the vaginal mucosa by the glass electrode method was found to be the most accurate and reliable method. In 632 readings on 100 normal women the pH was found to vary from 4·0 to 5·0 in all except 3% of the determinations. A pH gradient was found in the vagina of most patients, the highest acidity being generally encountered in the anterior fornix. The lowest values were obtained in the lower third of the vagina, while readings obtained in the posterior fornix usually varied considerably. It appears that the pH gradually falls, to reach its lowest point at the mid-cycle and then to rise gradually to its highest values at the premenstrual stage. It seems that the vaginal pH is the strongest immediate factor determining the type of organisms present in the vaginal tract.

Origin of Ovarian Adhesions from Organized Liquor Folliculi in the Rhesus Monkey.

C. G. HARTMAN (*Surgery, Gynecology and Obstetrics*, April, 1944) has studied further the occurrence in the Rhesus monkey of strands of tissue, mostly thread-like, but ranging up to one millimetre or more in diameter, connecting an ovary with the omentum or with the tubal fimbriæ. He considers that these strands of tissue arise by ingrowth of connective tissue and blood vessels into a scaffolding of viscous and tenacious *liquor folliculi* issuing as a thread from a fresh *corpus luteum*. Such strands have been seen in the making, and their persistence has been followed by subsequent laparotomies. Older adhesions can often be traced to *corpora albicantia*, and luteal tissue may be found in the proximal ends of the strands. Even delicate threads have been shown to persist for as long as seventy days; more robust threads probably last much longer. In two monkeys, the adhesions proved to be evanescent structures disappearing spontaneously. Certain papillæ on the surface of the ovary may be remnants of such adhesions; this was proved in the case of one monkey. The author is unable to state whether such adhesions occur in women. He thinks they may be present, but that the surgeon may regard them as insignificant. It is possible that if they do occur in women, they may at times cause slight discomfort. It was reported to the author that in a monkey an adhesion was found strong enough to have held an entangled loop of the intestine and possibly caused strangulation.

Intramenstrual Bleeding and Abdominal Pain.

ROBERT N. RUTHERFORD (*The Western Journal of Surgery, Obstetrics and Gynecology*, February, 1944), summarizing the conclusions of various workers, states that ovulation occurs about the middle of the menstrual cycle. In some women it is associated with slight vaginal bleeding or discharge. In some it is also associated with pain of varying recurrence and intensity. This pain may simulate an acute abdominal condition, and the author has suggested that the examination of vaginal washings for macroscopic or microscopic blood may help to avoid errors in diagnosis. He studied a group of patients who complained of intermittent or periodic intermenstrual pain, comparing them with a similar group of normal young women. Vaginal washings with one ounce of normal saline solution were taken on each day of the menstrual cycle except the days

of menstruation and the following three days. These were centrifuged and examined for microscopic blood. Of twenty normal young women, 85% were found to have some degree of bleeding about the time of ovulation. It appeared on the average of 11·7 days before the onset of the next period and lasted for an average of 2·7 days. Pelvic examination revealed some degree of tenderness in the normal women in 79% of cases at this time. Endometrial biopsies at the same time gave patterns corresponding to the ovulation stage. Of twenty patients complaining of attacks of pain in the mid-menstrual period, 75% showed microscopic blood in the vaginal washings obtained when the pain was present. Endometrial biopsies, performed in sixteen of the cases, were compatible with the period of ovulation. The author believes that this mid-menstrual pain, or *"Mittelschmerz"*, is caused by the rupture of the Graafian follicle and, in most cases, does not call for surgical interference. He contrasts it with pain due to rupture of a *corpus luteum*, which occurs somewhat later in the cycle and does not appear to be associated with the presence of blood in the vaginal washings. These latter cases may cause shock from continued hæmorrhage and may necessitate operation. He concludes that examination of the vaginal washings may be of value in the occasional obscure case of right-sided pain in young women. They may also be used in dating the time of ovulation in sterility studies.

OBSTETRICS.

Spinal Anæsthesia and Forceps Delivery.

ELLEN B. COWAN (*The Journal of Obstetrics and Gynæcology of the British Empire*, December, 1943) reports on the use of spinal anæsthesia for forceps deliveries in the Glasgow Royal Maternity Hospital. The conditions in which the method has been found advantageous are: (i) Deliveries following prolonged labour when the patient is becoming exhausted. (ii) When an anæsthetic has been already given during the labour. (iii) In the presence of cardiac disease, especially with an associated chest condition. (iv) In albuminuria or other constitutional condition in which a general anæsthetic would be contraindicated. The cases in which it would not be suitable are: (i) When the head is high and the uterus is contracted in an occipito-posterior presentation. Manipulation to correct this condition would be almost impossible. (ii) In an abnormal presentation requiring intra-uterine manipulation, for example, internal or external version. (iii) In any disease of the central nervous system or of the vertebræ or any septic condition at the site of lumbar puncture. The aim is to confine the anæsthesia to the level which would affect the perineum and pelvic floor, that is, a low spinal anæsthesia. Therefore a small dose of a heavy solution is used with the patient in the upright position during the administration. In the series of sixty cases reported it was found that a 20% "Planocaine" solution produced the best results. Ephedrine, one and a half grains, was given if the blood pressure was low. The advantages of the method are: (i) The general condition of the patient both during and after the operation is better than with a general anæsthetic. (ii) There is less hæmorrhage in the third stage owing to better uterine retractions. (iii) The regional nerve block cuts out the reflex stimuli from the perineum; this, with the reduction in hæmorrhage, removes the main factors productive of obstetric shock. (iv) The anæsthesia will not produce or aggravate any pulmonary or toxæmic condition. It is advised in these cases not to give pituitrin before the placenta has been expelled, as it causes spasm of the cervix and retention of the placenta if given before. Among the sixty patients there was one maternal death (that of a patient with severe bronchitis and dyspnœa). The fœtal stillbirths occurred only among infants in whom a contributory cause was present. Otherwise the infants were in good condition.

Hæmorrhage as the Most Important Cause of Maternal Death.

CHARLES A. GORDON (*American Journal of Obstetrics and Gynecology*, September, 1943) states that the number of puerperal deaths in the United States is steadily decreasing. In 1941, the year for which the latest figures are available, the rate was 3·2 per 1,000 live births, or 48% lower than 1933. The rate varied in different States from 1·6 to 6·2. The rates for Negro women in 1940 and 1941 were nearly two and a half times those of white women. Statistically, the author points out, infection is responsible for the greatest number of maternal deaths; yet this is not a wholly satisfactory statement, because maternal deaths are often the outcome of a complex series of circumstances, and often infection would not occur at all, or death would not follow, if blood loss had not been considerable. Sepsis and hæmorrhage are obstetric bedfellows. Every physician knows that lost blood must be replaced by blood or a satisfactory substitute, yet in practice undue confidence is had in almost everything else, and blood and plasma are by no means as widely used as they should be. Every practitioner does not realize that even a slight decline in the systolic pressure is of great significance and is not an early symptom. Nor does every practitioner know that crystalloid solutions are ineffective if blood loss has been serious, and that only large amounts of blood will save life. Nor is everyone aware that infusion of plasma may be accelerated by the syringe, when time presses, or that the sternum may be used for administration of blood and plasma, by drip or syringe, when veins are collapsed. The author concludes by stating that hæmorrhage is the outstanding controllable factor in puerperal mortality. Far more common everywhere than is indicated by its statistical frequency, it has not yielded to preventive measures which can be clearly outlined.

The Placenta in Eclampsia and Nephritic Toxæmia.

N. M. FALKINER AND J. O. E. APTHORP (*The Journal of Obstetrics and Gynæcology of the British Empire*, February, 1944) have studied over 100 cases of toxæmia occurring in the Rotunda Hospital, Dublin. The object of the paper is to show certain constant lesions of the placenta associated with eclampsia, often difficult to recognize because of their acute nature. The authors point out that placental infarcts may be due to interference with either the fœtal or the maternal blood supply. It is their opinion that the lesion in eclampsia is nearly always related to the fœtal circulation and mostly acute, whereas in chronic nephritis the lesion is usually in the maternal circulation and chronic. Three stages of infarction are described. The first and second stages may always be seen in conjunction with eclampsia. The third stage is a constant finding in association with pregnancy complicating chronic nephritis and may also be found in patients who have developed eclampsia after a prolonged period of albuminuria (preeclampsia). In regard to the ætiological importance of the lesions of eclampsia the authors quote Young's recent work on the existence of placental toxins. One possible result of placental damage is that fœtal blood may be extravasated into the intervilleus spaces. In this case there may be forthcoming an explanation for the occurrence of eclampsia comparable to the recent explanation of *erythroblastosis fœtalis*.

Carcinoma of the Cervix in Pregnancy.

CHARLES R. MAINS AND ROBERT D. MUSSEY (*The American Journal of Obstetrics and Gynecology*, February, 1944) analyse a series of twenty-six cases of carcinoma of the cervix associated with pregnancy. They conclude that there is no particular age group for this combination and that the prognosis is no worse in the younger patients. Neither is it affected by the number of previous pregnancies. In many of the authors' cases pregnancy was found to supervene on an existing carcinoma. Bleeding was the initial symptom in 88·5% of cases, and the cause was often overlooked because of the tendency of the patient to avoid pelvic examination during pregnancy. The bleeding was more often produced by trauma; it can occur spontaneously. An aqueous and odorous discharge was found to be a late symptom. The effect of pregnancy on the carcinoma appears to differ in many individuals, but in the majority of cases there is thought to be no significant alteration in the behaviour of the carcinoma because of pregnancy. The effect of carcinoma on the pregnancy depends on treatment. When no treatment is carried out two-thirds of the pregnancies proceed to full term, but in these only a third of the infants survive delivery by the vaginal route. The child of a carcinomatous mother is not likely to be retarded or below normal viability unless the mother is cachectic. Attempts to treat the carcinoma by irradiation therapy without interrupting the pregnancy resulted in 63% of abortions; and of the children who progressed to term 18% proved to be microcephalic idiots. Consequently the treatment of choice in operable cases appears to be total hysterectomy followed by irradiation if the fœtus is not viable and Cæsarean section followed by these procedures if the fœtus is viable. In non-operable cases Cæsarean section followed by irradiation is indicated if the fœtus is viable and irradiation alone if the fœtus is not viable.

British Medical Association News.

SCIENTIFIC.

A MEETING of the New South Wales Branch of the British Medical Association was held on April 20, 1944, at the Royal Alexandra Hospital for Children. The meeting took the form of a series of clinical demonstrations by members of the honorary medical staff of the hospital. Part of this report was published in the issue of June 10, 1944.

Pigmented Nævis of the Head.

DR. H. G. HUMPHRIES showed a female child, aged three years, who had been admitted to hospital in November, 1942, on account of the presence of a large black nævus extending over the right half of the forehead, down the right cheek including the right upper and lower eyelids, and extending back and up about three inches into the hair line. A tube graft was made from the abdomen to the right forearm, and the abdominal attachment was then moved to the forehead, movement of the arm being restricted with plaster. One month later the portion of the nævus on the forehead was dissected away, and the tube graft was opened out and sutured to the edges of the skin. The graft took well and healed.

The child was readmitted to hospital three months later. Some pigmented patches were found on the grafted skin, and these were removed. A tube graft was formed on the left side of the abdomen, and three months later it was attached to the right forearm. Three weeks later again the tube graft was transplanted from the right forearm onto the scalp, and in another month's time it was opened out and stitched to the scalp over the area of the excised portion of the nævus. At the time of the meeting the graft had completely healed, and carbon dioxide snow was being applied to the small areas of nævus remaining around the eyelid.

Hirschsprung's Disease.

Dr. Humphries next showed a male child, aged four months, who had been admitted to hospital at the age of three months. The baby had been born four weeks prematurely; he had been vomiting since birth and was constipated, requiring an enema every day. On examination, the baby was seen to be emaciated, with a large sunken fontanelle and mongolian features. The abdomen was distended and tympanitic. Examination after a barium enema revealed considerable dilatation of the whole of the colon. The baby was given daily enemata, and his general condition was fair; but he gained very little weight.

Dr. Humphries also showed a male child, aged eight years, who had first been admitted to hospital at the age of two years with a history of constipation since birth. He was readmitted to hospital four years later with constipation and a distended abdomen. X-ray examination suggested that the colon was enlarged, but within normal limits. The child was again admitted to hospital in May, 1943, and a left ramisection was performed, after which his bowels were open without aperients. One month later right ramisection was performed. Dr. Humphries said that the bowels opened normally at times, but some enemata still had to be given. An X-ray examination in May, 1943, revealed fairly advanced dilatation of the colon.

Ectopia Vesicæ.

Dr. Humphries then showed two patients suffering from *ectopia vesicæ*. The first was a child, aged three years, who had been admitted to hospital at the age of sixteen months in September, 1942, suffering from *ectopia vesicæ* and prolapse of the rectum. The prolapsed tissue was injected with absolute alcohol, and the injection was repeated nine months later; one year later again the tissue was injected with sodium morrhuate. Dr. Humphries said that operative treatment of the *ectopia vesicæ* would be undertaken later.

The next patient shown by Dr. Humphries was a girl, aged eight years, who had been subjected to operation some time previously. The child was admitted to hospital in April, 1942, suffering from complete extrophy of the bladder. X-ray examination revealed congenital wide separation of the pubic bones, but the remainder of the pelvis was normal. Mild bilateral hydronephrosis was present, and both ureters, which were dilated, opened externally into the ectopic bladder. The blood urea level was 36 milligrammes per 100 cubic centimetres. The right ureter was transplanted into the rectum. One year later the left ureter was transplanted into the rectum. One year later again the bladder was returned to the abdomen and the abdominal wall was closed. Dr. Humphries said that the ureters were functioning well and the child's condition was satisfactory.

Osteomyelitis.

DR. L. G. TAIT showed two patients suffering from osteomyelitis. The first was a male child, aged five years, who had been admitted to hospital on January 25, 1944, after an illness of two days' duration; the child was feverish and vomiting, and the right leg was swollen. On examination, the child was seen to be extremely ill; he was cyanosed, and impetiginous sores were present on the face; the right ankle was swollen and painful. He had a convulsive seizure soon after his admission to hospital. A transfusion of six ounces of citrated blood was given. Next day an incision was made over the swelling over the right ankle; pus was found under the periosteum. A gauze wick was left in the wound. The child was given a further blood transfusion three days later. The wound drained well, and the child's condition gradually improved. At the time of the meeting he was apyrexial; his leg was in a plaster cast. No growth of organisms was obtained on attempted culture from the blood. An X-ray examination revealed osteomyelitis of the lower two-thirds of the right tibia and of the lower epiphysis, with early involvement of the ankle joint. A sequestrum was seen in the epiphysis towards the anterior aspect. Periostitis of the lower end of the tibial diaphysis was also seen.

Dr. Tait's second patient was a female, aged ten years, who had been admitted to hospital in August, 1942, having been ill for ten days. She was suffering from pyrexia and from pain in the left hip. On examination, it was seen that the left thigh was everted and externally rotated. The left femur was drilled, but no pus was found. The child was very ill, and blood transfusions were given. X-ray examination at the time of her admission to hospital revealed no bony lesion. *Staphylococcus aureus* was grown in culture from the blood. One month later X-ray examination revealed osteomyelitis of the right pubis and ischium, with possible necrosis of the neck of the left femur. The child continued to be very ill for many months, discharging sinuses being present. She was nursed with strapping extension and later on a frame. A further X-ray examination in November, 1942, revealed complete separation of the head of the left femur with upward dislocation, the head being left in the acetabulum. In August, 1943, X-ray examination revealed that the lesion in the right pubis was stationary, and no further bone destruction had occurred in the left femur. Bony ankylosis was commencing between the femur and the ileum. On February 7, 1944, the head of the femur was discharged through a sinus as a complete sequestrum. X-ray examination on February 23 revealed upward subluxation of the left hip, with obliteration of the acetabulum and formation of a false joint. The appearance of the pubic bones was unchanged. Dr. Tait said that the child had been got up on a frame with crutches and taught to walk.

A Case for Diagnosis.

Dr. Tait finally showed a male patient, who had first been admitted to hospital on September 26, 1936, at the age of twenty months. At that time a mass was present in the abdomen and the child was in pain and passing blood *per rectum*, and the condition was thought to be intussusception. Laparotomy was performed, and peritonitis was found, with adhesions about the appendix and free pus; the appendix was removed. Blood examination revealed that the erythrocytes numbered 1,680,000 per cubic millimetre, and three transfusions were given. The child's second admission to hospital occurred in January, 1937; he was vomiting, and the earlier pain had recurred. No treatment was given. In August, 1937, he was again admitted to hospital, suffering from the same pain and passing blood *per rectum*; the abdomen was rigid. Laparotomy was performed, and peritonitis with free pus was found; tissue removed for examination was found to be inflammatory. In October, 1937, the child's fourth admission to hospital took place; he was suffering from abdominal pain, vomiting, and passing blood *per rectum*; laparotomy revealed peritonitis with free pus. The erythrocytes numbered 1,880,000 per cubic millimetre, and three blood transfusions were given. In April, 1938, the child was again admitted to hospital, suffering from abdominal pain and passing blood *per rectum*. A transfusion was given. On January 30, 1942, the child was admitted to hospital for the sixth time suffering from abdominal pain and distension. Laparotomy revealed free pus; no organisms were grown on attempted culture. The erythrocytes numbered 2,600,000 per cubic millimetre, and two blood transfusions were given. The seventh admission

to hospital took place in September, 1943; the child was passing blood *per rectum*. The erythrocytes numbered 1,530,000 per cubic millimetre, and a blood transfusion was given. In December, 1943, the eighth admission to hospital occurred; once more the child was passing blood *per rectum*. The erythrocytes numbered 2,110,000 per cubic millimetre, and a blood transfusion was given.

Neuroblastoma of the Neck.

DR. C. H. WESLEY showed a female child, aged two years, who had been admitted to hospital with a swelling of the right side of the neck. The mother said that the swelling had been present since the child's birth, and had gradually been increasing in size. On examination, the child looked healthy. A large, firm, rounded swelling was present on the right side of the neck under the sterno-mastoid muscle; it appeared to be fixed to the deeper structures. The lower pole was smooth and rounded; the upper pole was hard and the border was craggy. No reaction was obtained to the Mantoux test carried out with tuberculin diluted one in 1,000 and one in 100. The blood sedimentation rate was six millimetres in the first hour and fourteen millimetres in the second hour. X-ray examination of the chest, skull and long bones revealed no abnormality. Operation was performed on July 14, 1943; the tumour was shelled out and tied off from its fibrous connexion. Histologically the tumour was found to belong to the neuroblastoma group, though the degree of cellular differentiation was greater than usually encountered in such tumours arising from the adrenal medulla. The appearance suggested a primary growth arising from portion of the cervical sympathetic chain. After operation the patient suffered from Horner's syndrome (the right pupil was smaller than the left, and ptosis occurred), but otherwise convalescence was uneventful. She was given two courses of deep X-ray therapy before her discharge from hospital.

Diaphragmatic Hernia.

DR. P. L. HIPSLEY showed a female infant, aged nine months, who had been admitted to hospital at the age of two and a half months with a history of recurrent attacks of cyanosis; the child had had no difficulty in feeding. On examination, the baby was seen to be somewhat sunken-eyed; crepitations were present at the base of the right lung. The apex beat was not palpable, and cardiac dulness was present to the right of the sternum. An X-ray examination revealed congenital absence of the left half of the diaphragm; the colon was seen to lie in the left half of the chest, and the heart was much displaced over to the right. Dr. Hipsley said that the child was discharged from hospital, and since then she had reported at intervals. Operation would be considered when she was older.

Congenital Stenosis of the Common Bile Duct.

Dr Hipsley next showed a male infant, aged two and a half months, who had been admitted to hospital with a history of jaundice of one week's duration. The motions were clay-coloured and the urine was very dark. No vomiting had occurred. The child had had a previous attack of jaundice, which had lasted for one week. On examination, the baby was seen to be severely jaundiced. The liver was palpable below the costal margin. The stools were completely colourless, and the urine contained bile.

Operation was performed on January 25, 1944. When the abdomen was opened no common bile duct could be found. The cystic duct was dilated and contained bile, and the gall-bladder was dilated. A right paramedian incision was made, and the cystic duct was anastomosed with the second part of the duodenum, a rubber tube being left in the anastomosis from the cystic duct to the duodenum. The child's condition after operation was satisfactory, and three days later the stools passed were brown in colour. Dr. Hipsley said that the jaundice had gradually lessened, and the tube was passed *per rectum* seventeen days after operation. The child had continued to progress satisfactorily and gain in weight.

Ovarian Cyst.

Dr. Hipsley finally showed a female patient, aged eleven years, who had been admitted to hospital with the history that her abdomen had been growing larger and becoming hard for two months. She had also had some difficulty in breathing. She had not lost much weight, nor had she vomited. On examination, the patient was seen to be a thin child. The abdomen was very large and evenly distended; it was hard, but it appeared that a large cystic mass was present, which was not tender. No other abnormality was detected.

At operation on March 21, 1944, a mid-line incision was made, extending from the xiphisternum to the pubis. An enormous ovarian cyst was gradually extruded through the wound and then removed, and the wound was closed. The cyst weighed eleven pounds nine ounces. Dr. Hipsley said that the child had progressed satisfactorily since the operation.

Hydatid Cyst of the Brain.

DR. J. SHEDDEN DAVIS showed a male child, aged three years, who had been admitted to hospital because he had been limping with the left leg for about eight weeks. The limp had developed gradually, and slight weakness of the left arm had been noticed as well. He did not complain of pain, and his general health was good. He had had no previous illnesses except gastro-enteritis, and he had always lived in the country.

On examination, it was seen that the child had a very large head, the circumference being 22 inches. He limped on the left foot. The cranial nerves were intact; the pupils were equal and reacted to light and accommodation; the knee jerks were indefinite and the abdominal reflexes were absent on the left side. Muscle power in the left arm appeared good. An X-ray examination of the skull revealed widening of the sutures, especially the saggital and coronal sutures; the appearances suggested a cerebral tumour. Examination of the optic fundi revealed papilloedema on both sides. A ventriculographic examination was made, and at the same time a flap of bone was removed from the occipital region and the cerebellum was aspirated. Examination of the cerebro-spinal fluid revealed no abnormality. The ventriculogram revealed a large cystic area in the right parietal region; what appeared to be a cyst wall was seen outlined by a crescent of air caught between the wall and the brain tissue. The appearances suggested that the condition might be a large hydatid cyst. The Casoni test failed to produce a reaction.

Craniotomy was performed on March 20, 1944, under "Avertin" and local anæsthesia. A bone flap was raised and the cyst wall could be seen pulsating. The cyst was injected with formalin and aspirated, and then lifted out. The wound was then sutured. Dr. Davis said that the morning after the operation the child had become unconscious; lumbar puncture was performed, and later aspiration of the brain was carried out. Next day the patient's condition had improved, and he had continued to make satisfactory progress since.

Dislocation of the Hip.

DR. G. KEITH SMITH showed two patients suffering from dislocation of the hip; in one case the dislocation was congenital and in the other acquired. The first patient was a male, aged five years, who had been admitted to hospital with a history of congenital dislocation of the left hip, which had previously been treated in another State. X-ray examination revealed that the left acetabulum was poorly developed, and that the left femur was rotated and the head displaced upwards. Extension by ten pounds' weight was applied to the affected leg. The weight was kept on for ten weeks, but the position of the femoral head was still unsatisfactory, so the hip was manipulated and a plaster spica was applied in the "frog" position. The spica was kept in position for four months, and the position was satisfactory, although the head of the femur was too large for the shallow acetabulum.

On March 17, 1944, a shelf operation was performed. An incision was made over the left hip, and a piece of bone was taken from the ilium and grafted as a shelf to the left hip. Extension was maintained by ten pounds' weight applied to the left leg with strapping.

Dr. Smith's second patient was a girl, aged six years, who had been admitted to hospital in October, 1941, suffering from extensive burns sustained four months previously, when her clothes had caught fire. The burns had not healed; they extended over most of the back, the buttocks and the posterior and lateral aspects of the right thigh. The child remained in hospital for nearly two years before the burns were finally healed with the aid of skin grafting. She was then allowed to return home for three months, to reenter hospital for further skin grafting to the buttocks if necessary. When the child began to walk again, she was found to limp; X-ray examination revealed dislocation of the left hip joint. The hip was manipulated under general anæsthesia, but the dislocation could not be reduced.

Spondylolisthesis.

Dr. Smith finally showed a female patient, aged twelve years, who had been admitted to hospital in October, 1943. For five months she had been complaining of pain in both legs and in the back when standing. She had fallen off a

bicycle nine months previously. On examination, the patient was seen to be a big, healthy looking girl. She stood with the hips and knees flexed and the legs bowed; the gait was shambling, and hip movements were slightly restricted. Straight knee raising was much restricted, and pain was felt in the back on movement at the hips. X-ray examination revealed spondylolisthesis of the fifth lumbar vertebra on the sacrum, and also *spina bifida occulta* of the sacrum. Plaster casts were applied to both legs with the knees flexed at right angles, and later the legs were raised until the thighs were perpendicular. X-ray examination two weeks later revealed no change, and two weeks later again the X-ray findings were the same. Extension was then applied to both legs.

Operation was decided upon, and was carried out on February 4, 1944. A long mid-line incision was made over the second, third, fourth and fifth lumbar vertebræ and part of the sacrum. The cartilages of the articular processes of the third, fourth and fifth lumbar vertebræ were destroyed, the lamellæ were chipped and the spines were fractured. The periosteum of the right tibia was removed and bridged between the fifth lumbar vertebra and the sacrum. Bone chips were placed about the third, fourth and fifth lumbar vertebræ and the wound was sutured. Healing was satisfactory. The child was nursed on a turning case and frame.

Encephalocele.

DR. G. M. B. HALES showed a female infant, aged five weeks, who had a large tumour on the back of the head between the occiput and the neck. The saggital suture was wide and tense; the arms and legs were spastic, and bilateral talipes was present.

Imperforate Anus.

Dr. Hales also showed a female infant, aged four months, who had been admitted to the hospital at the age of two days with a dimple only in the region of the anus. A colostomy was established on the day of her admission to hospital, and had functioned well since. The child had made satisfactory progress and was gaining in weight. X-ray examination revealed that the distal loop of the bowel was of good calibre, but ended about one and a half inches above the normal anus.

Correspondence.

WHEAT BREAKFAST FOODS.

SIR: The letter on wheat breakfast foods by Dr. L. P. Winterbotham in your issue of June 3 brings up the general question whether we should assess the nutritional value of any foodstuff by its content of one particular ingredient, however important. There is only one perfect food, namely, milk, during a very limited period in the early life of the mammal; when this stage is passed a variety of foods must be sought so that a specific deficiency in any one of them can be corrected by relative abundance in another. If we take thiamin as our criterion of nutritional excellence, then we must put in our *index ciborum prohibitorum* such substances as macaroni, vermicelli, tapioca, white of egg, and even butter itself which contain none; whilst cheese, rhubarb and some varieties of grape and strawberry have only a mere trace.

The problem is further complicated by the ability of intestinal bacteria to synthesize vitamins. In the early days of vitamin research many investigators were puzzled by the fact that rats could live and thrive in the absence of thiamin and ascorbic acid; then it was discovered that this animal can produce in its intestine sufficient quantities of these for its needs. We now know that the human body can, thanks to bacterial action, produce endogenous thiamin (*British Medical Journal*, March 4, 1944, page 332). How far the amounts elaborated depend on the diet and whether these are adequate for human requirements further research will disclose. But until this has been settled a Procrustean standard for foodstuffs cannot be scientifically maintained.

Yours, etc.,

W. A. OSBORNE.

The Hall,
Kangaroo Ground,
Victoria.
June 8, 1944.

FUNGUS POISONING.

SIR: Anent the recent article by J. E. Trotter (THE MEDICAL JOURNAL OF AUSTRALIA, April 29, 1944) entitled "A Report of Nine Cases of Fungus Poisoning", the following excerpt may be of interest.

Dr. Trotter states that he has found but two cases described in the literature. The present case was described nearly eighty years ago and will be found in the *Tumut and Adelong Times* for February 13, 1865 (Mitchell Library, Sydney).

Vegetable Poison.

> Yesterday's *Maitland Ensign* states that on Friday morning last, a child under three years of age, the daughter of Mr. G. Tucker of Rathluba, was taken suddenly ill with uncontrollable laughter and total loss of power in the limbs. Medical aid was immediately sought. Dr. Moore was quickly in attendance and pronounced the child to be suffering from a vegetable poison, and administered an emetic, which soon caused to be ejected from the stomach a quantity of *agaricus psittacinus* (a poisonous mushroom, very small, with a dirty yellow top), a sample of which was afterwards discovered among the grass in the yard where the child had that morning been at play. A suitable antidote was administered, and in a few hours the child was out of danger and the next day was in her usual health.

Yours, etc.,

RICHARD T. KENNEDY.

Gundagai,
New South Wales,
June 7, 1944.

A NATIONAL MEDICAL SERVICE.

SIR: As against restrictions imposed by a national medical service, may I stress some of the liberties it may ensure?

Firstly, freedom from a competition admittedly mercenary in its scope, and waged therefore with weapons which are not predominantly skill and knowledge, but rather those comprising the "*argumentum ad hominem*", such as a "correct bedside manner", "tact", "placebos", the ability to listen patiently to a mass of irrelevant details, and to render unnecessary attendances merely to satisfy the patient, and so on—the sum total of which amounts virtually to a mild form of appeasement, clearly indicating that the patient is master of the situation, and not the medical man.

Secondly, this grievous anomaly is further exemplified by a consideration of my second freedom, that is, release from the drudgery of book-keeping—always irksome—but doubly obnoxious to a doctor by his knowledge that however equitable his fees, they may have quite a different aspect to his client, with resultant distrust, and that in many instances he is wasting time and trouble in sending account after account to those who, determined not to pay, bask in the knowledge that for ethical reasons paramount in our profession, the doctor dare not refuse attendance.

In conclusion, is not the appeal of medicine to us as a field of absorbing interest, with its opportunities for research and distinction, infinitely greater than its attractions as a mere means of livelihood? Surely, then, the assumption that a medical man, once his income is assured by the nation, will subside into a perfunctory routine, constitutes an insult to our intelligence?

Yours, etc.,

H. LISTER.

Bermagui South,
New South Wales,
June 8, 1944.

Obituary.

NORMAN DAWSON ROYLE.

WE are indebted to Professor A. N. Burkitt for the following appreciation of the late Dr. Norman Dawson Royle.

Norman Dawson Royle commenced his medical course in 1910 with clear ideas as to what he wanted to learn.

A little older than the average student, he had been an instructor in physical training before he started medicine. His interest in this work determined his decision to become an orthopædic surgeon, and from the moment he entered his medical course he concentrated upon the studies which would contribute to a better knowledge of the fundamentals of his future specialty. He was confirmed in this choice of a career by the advice and help of his honorary surgeon while resident medical officer at Lewisham Hospital. From the first he displayed great technical skill and ability, combined with a strong critical faculty which refused to accept dogma in orthopædic practice.

Soon after graduation in 1914 he became associated with the late Professor John Irvine Hunter, then a medical student, and their close collaboration continued until Hunter's death in 1924. Royle's most active period was from about 1916 to about 1925, when he and Hunter were associated in a number of researches upon regeneration in nerve and muscle, the activity of muscles, reflex action in the spinal cord and spinal shock, the sympathetic innervation of muscle and muscle tone. At the same time Royle was carrying on active clinical work, and soon after graduation and hospital residency he became absorbed in rehabilitation orthopædic work in connexion with wounded soldiers then returning from Gallipoli and France, and for several years he carried out most valuable work as honorary specialist consultant to the Prince of Wales Hospital.

The details of some of Royle's early work have been supplied to the writer by Dr. T. W. Lipscomb, who was associated with him at that time. As guinea-pigs and cats were too small for Royle's purposes, it was decided to use goats. These animals were subjected to ramisection (they were decerebrate animals) and the results were studied on the side on which operation had been performed and on the intact side. Awaiting operation and asking everyone concerned to hurry, was an injured soldier who had developed a spastic condition of both legs. The operation of ramisection was performed on a number of cadavers and at length the soldier's turn came. Royle performed the operation on one side. No electrically lighted retractors were then available and the depths of the wound were illuminated by means of a pencil electric torch inside the finger of a rubber glove. The immediate effects of blushing and rise of temperature on the side that had been operated on were apparent, and when the patient eventually got onto his feet again a lessening of the spastic condition was noted. Moving pictures of the man's condition were taken by Royle, and this was possibly the first time in which cinematography was used in surgical work in this country. Royle subsequently became a most enthusiastic and expert "movie camera" man and film evenings at his home were enjoyed by many of his friends. The first patient submitted to ramisection suffered from constipation, and after operation he was relieved of this disability. This observation led to the introduction of ramisection in the treatment of megacolon where it is often very effective.

Roughly, the hypothesis upon which Royle's work was based was that uncontrolled sympathetic innervation of muscles, following upon pyramidal tract injury, caused increased activity, that is, spasticity in voluntary muscles, and that this would be relieved by ramisection. This was, of course, based upon the observation of the Dutch histologist Professor Boeke and the Russian professor Kulchitsky, which seemed to show that there was a double innervation of voluntary muscle. It is now believed that the observations of both Boeke and Kulchitsky demand some other explanation, while the work of Wilkinson and Phillips would seem to indicate that any effect upon voluntary muscle obtained by ramisection was due to vascular disturbances in the muscle, which affected the sensory muscle spindles and tendon organs, the structures concerned in the afferent side of the "stretch reflex" and the maintenance of so-called "plastic tonus". The mechanism of the "stretch reflex" was being elaborated by Sherrington and Brian Matthews and others during this same period (1924-1930). Royle's work aroused such wide interest that following on visits to Australia of Sir William McEwan in 1923 and William Mayo in 1924, Hunter and Royle were asked to go to America to give the Murphy Oration upon the surgery of the sympathetic nervous system before the American College of Surgeons. They spoke before a crowded audience in the Waldorf Astoria in New York and Royle demonstrated their operations in various hospitals and clinics in the United States. This ill-fated trip was followed by Hunter's death in London. While in Boston, Royle developed what appeared to be a mild attack of influenza, but on the return voyage further cerebral symptoms developed, and it was this attack which probably led to the Parkinsonian condition which gradually developed and which was to cloud his later life.

While much of Royle and Hunter's work has not been completely borne out, nevertheless they stimulated scientists, clinicians and surgeons throughout the world to a reinvestigation of the vegetative nervous system and to the discovery of many new facts about its structure and function.

During 1924 Royle was at his peak, and it was fascinating to watch his sure touch in operations upon orthopædic patients and his after-care of them. It was during these early years also that he trained himself in the voluntary control of individual muscles of his own body. He could contract individually such muscles as the omohyoid, the supraspinatus and infraspinatus muscles; he could contract one *rectus abdominus* muscle while its fellow was relaxed and even such muscles as the anconeus and gracilis. We have some record of all these activities in various publications which appeared from time to time in this and other journals, and also in a small book which he published in recent years upon the action of muscles.

He held many posts, being honorary consulting orthopædic surgeon to Lewisham Hospital, specialist consultant to the Prince of Wales Hospital and honorary demonstrator in anatomy in the University of Sydney. He was a corresponding member of the American Orthopædic Academy, member of the British Orthopædic Association, corresponding member of the Boston Orthopædic Club, member of the International Society of Orthopædics and Traumatology, corresponding member of the American Academy of Orthopædic Research and a Foundation Fellow of the Royal Australasian College of Surgeons.

After about 1930, owing to illness, his work gradually declined, and in later years he was forced to reduce his activities, though he still retained an intense interest in the scientific aspect of his work. Those of us who knew him will always retain the memory of him in his early years, keen, energetic, sure of himself and critical, a first-class operator with an uncanny insight into diseased conditions in muscle, joints and bone. Our sympathy goes to his wife and five sons. Four of his sons are on active service, one of them a medical graduate; the fifth son is studying medicine.

Naval, Military and Air Force.

CASUALTIES.

ACCORDING to the casualty list received on June 9, 1944, Major D. M. Brown, A.A.M.C., Echuca, has been removed from the "seriously ill" list.

Nominations and Elections.

THE undermentioned have applied for election as members of the New South Wales Branch of the British Medical Association:

Potts, Theodore Kenneth, junior, M.B., B.S., 1944 (Univ. Sydney), 20, Glebe Road, Glebe.

Potts, Ian Faulkner, M.B., B.S., 1944 (Univ. Sydney), Royal Prince Alfred Hospital, Camperdown.

Menzies, Bruce Lambton, M.B., B.S., 1944 (Univ. Sydney), 14, Wolseley Street, Drummoyne.

Medical Appointments.

Dr. Lorna Margaret Archibald has been appointed Junior Medical Officer, Department of Health and Home Affairs, Queensland, in pursuance of the provisions of *The Public Service Acts*, 1922 to 1924.

Dr. John A. L. Wallace, Killara, has been appointed an Official Visitor to the Mental Hospital, Morisset, New South Wales.

Dr. Esmond Frank West has been appointed Temporary Honorary Assistant Orthopædic Surgeon at the Royal Adelaide Hospital.

Books Received.

"The 1943 Year Book of Obstetrics and Gynecology", edited by J. P. Greenhill, B.S., M.D., F.A.C.S.; 1943. Chicago: The Year Book Publishers, Incorporated. 7" × 4¾", pp. 584, with illustrations. Price: $3.00.

"The 1943 Year Book of Dermatology and Syphilology", edited by Marion B. Sulzberger, M.D., assisted by Rudolf L. Baer, M.D. Chicago: The Year Book Publishers, Incorporated. 7" × 4¾", pp. 584, with illustrations. Price: $3.00.

"The Blood Pressure and its Disorders, including Angina Pectoris", by John Plesch, M.D. (Budapest), M.D. (Berlin), L.R.C.P. and S. (Edinburgh and Glasgow); 1944. London: Baillière, Tindall and Cox. 8½" × 5½", pp. 151, with 61 illustrations. Price: 15s. net.

"Notes on Electrocardiography", compiled by T. D. Orban; 1944. Sydney: Australasian Medical Publishing Company, Limited. 9¾" × 6¼", pp. 30. Price: 3s. 6d.

"Infant Feeding", by V. L. Collins, M.D. (Melbourne), M.R.C.P. (London), D.C.H. (London); Third Edition, 1943. Melbourne: W. Ramsay (Surgical) Proprietary, Limited. 8¼" × 6", pp. 76. Price: 3s. 9d.

"The Conquest of Some Problems of Modern Life through Psychology and Religion", by W. L. Carrington; 1943. Second Printing. Melbourne: Surrey Hills and District United Fellowships. 8½" × 5½", pp. 48. Price: 1s. 6d.

"The 1943 Year Book of Pediatrics", edited by Isaac A. Abt, D.Sc., M.D., with the collaboration of Arthur F. Abt, B.S., M.D. Chicago: The Year Book Publishers, Incorporated. 7" × 4¾", pp. 448, with illustrations. Price: $3.00.

"Questions and Answers"; Volume II; 1942. Chicago: American Medical Association. Sydney: Angus and Robertson, Limited. 8½" × 5½", pp. 468. Price: 16s.

"Orthopædic Surgery", by Walter Mercer, M.B., Ch.B., F.R.C.S. (Edinburgh), F.R.S. (Edinburgh), with a foreword by Sir John Fraser, Bart., K.C.V.O., M.C., F.R.S. (Edinburgh), F.R.C.S. (Edinburgh), M.D., Ch.M., F.R.A.C.S., F.A.C.S.; 1943. Third Edition. London: Edward Arnold and Company. 9" × 5¾", pp. 956. Price: 45s. net.

"Physical Foundations of Radiology", by Otto Glasser, Ph.D., Edith H. Quimby, Sc.D., Lauriston S. Taylor, Ph.D., and J. L. Weatherwax, M.A.; 1944. New York: Paul B. Hoeber, Incorporated. 7½" × 5", pp. 435, with diagrams.

"Clinical Lectures on the Gallbladder and Bile Ducts", by Samuel Weiss, M.D., F.A.C.P.; 1944. Chicago: The Year Book Publishers, Incorporated. 9" × 6", with illustrations. Price: $5.50.

"A Collection of Articles on the Electrical Factor in Metabolism", by W. N. Abbott, M.C., M.B., B.S. (Melbourne), and E. F. Fowler, M.B., Ch.B. (Otago). Wellington: The Commercial Printing Company, Limited. 9¾" × 6", pp. 180.

Diary for the Month.

JUNE 19.—Victorian Branch, B.M.A.: Hospital Subcommittee.
JUNE 19.—Victorian Branch, B.M.A.: Finance Subcommittee.
JUNE 20.—New South Wales Branch, B.M.A.: Medical Politics Committee.
JUNE 20.—Victorian Branch, B.M.A.: Organization Subcommittee.
JUNE 21.—Western Australian Branch, B.M.A.: Branch Meeting.
JUNE 22.—New South Wales Branch, B.M.A.: Clinical Meeting.
JUNE 22.—Victorian Branch, B.M.A.: Executive Meeting.
JUNE 23.—Queensland Branch, B.M.A.: Council Meeting.
JUNE 27.—New South Wales Branch, B.M.A.: Ethics Committee.
JUNE 28.—Victorian Branch, B.M.A.: Council Meeting.
JUNE 29.—New South Wales Branch, B.M.A.: Branch Meeting.
JULY 4.—New South Wales Branch, B.M.A.: Council Quarterly.
JULY 5.—Victorian Branch, B.M.A.: Branch Meeting.
JULY 5.—Western Australian Branch, B.M.A.: Council Meeting.
JULY 7.—Queensland Branch, B.M.A.: Branch Meeting.
JULY 7.—Victorian Branch, B.M.A.: Legislative Subcommittee.
JULY 11.—New South Wales Branch, B.M.A.: Executive and Finance Committee.
JULY 11.—New South Wales Branch, B.M.A.: Organization and Science Committee.
JULY 11.—Tasmanian Branch, B.M.A.: Branch Meeting.
JULY 14.—Queensland Branch, B.M.A.: Council Meeting.

Medical Appointments: Important Notice.

MEDICAL PRACTITIONERS are requested not to apply for any appointment mentioned below without having first communicated with the Honorary Secretary of the Branch concerned, or with the Medical Secretary of the British Medical Association, Tavistock Square, London, W.C.1.

New South Wales Branch (Honorary Secretary, 135, Macquarie Street, Sydney): Australian Natives' Association; Ashfield and District United Friendly Societies' Dispensary; Balmain United Friendly Societies' Dispensary; Leichhardt and Petersham United Friendly Societies' Dispensary; Manchester Unity Medical and Dispensing Institute, Oxford Street, Sydney; North Sydney Friendly Societies' Dispensary Limited; People's Prudential Assurance Company Limited; Phœnix Mutual Provident Society.

Victorian Branch (Honorary Secretary, Medical Society Hall, East Melbourne): Associated Medical Services Limited; all Institutes or Medical Dispensaries; Australian Prudential Association, Proprietary, Limited; Federated Mutual Medical Benefit Society; Mutual National Provident Club; National Provident Association; Hospital or other appointments outside Victoria.

Queensland Branch (Honorary Secretary, B.M.A. House, 225, Wickham Terrace, Brisbane, B.17): Brisbane Associated Friendly Societies' Medical Institute; Bundaberg Medical Institute. Members accepting LODGE appointments and those desiring to accept appointments to any COUNTRY HOSPITAL or position outside Australia are advised, in their own interests, to submit a copy of their Agreement to the Council before signing.

South Australian Branch (Honorary Secretary, 178, North Terrace, Adelaide): All Lodge appointments in South Australia; all Contract Practice appointments in South Australia.

Western Australian Branch (Honorary Secretary, 205, Saint George's Terrace, Perth): Wiluna Hospital; all Contract Practice appointments in Western Australia.

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